

## REVISION OF GALPHIMIA (MALPIGHIACEAE)

Christiane Anderson  
University of Michigan Herbarium  
3600 Varsity Drive  
Ann Arbor, Michigan 48108-2287

**ABSTRACT.** *Galphimia* (Malpighiaceae, Byrsonimoideae, Galphimiceae) comprises 26 species of suffrutescent herbs, shrubs, and treelets. Four species (*G. amambayensis*, *G. australis*, *G. brasiliensis*, *G. platphylla*) occur in South America south of the Amazon basin, and the remainder in Mexico; one species (*G. angustifolia*) extends into Texas and one (*G. speciosa*) into Central America. One species, *G. gracilis*, is cultivated worldwide in warm regions. The genus is characterized by bilaterally symmetrical flowers with yellow to red petals; in eight species the petals are persistent. The sepals lack oil glands, but a few species bear calyx glands that resemble the leaf glands. The fruit is a globose schizocarp breaking apart into three small 1-seeded cocci. The base chromosome number is  $x=6$ . For each species a full synonymy, detailed description, and range map are provided; all but two species are illustrated. Three new species (*G. calliantha*, *G. floribunda*, *G. speciosa*) are proposed.

### INTRODUCTION

The Neotropical genus *Galphimia* Cav. (Malpighiaceae, tribe Galphimiceae) comprises 26 species of large herbs, shrubs, and treelets of mostly drier habitats. Most species occur in Mexico, with one extending to Texas and one ranging to northern Nicaragua, but four are restricted to South America, south of the Amazon basin. *Galphimia* is characterized by flowers with yellow petals (often suffused with red) borne in racemes, either solitary or arranged in panicles; in eight species the petals are persistent in fruit. The sepals lack the large oil glands typically found in other New World Malpighiaceae, but in a few species the calyx has one or more small glands that resemble the leaf glands. Ten fertile stamens surround a tricarpellate ovary with three subulate styles. The globose fruit is a schizocarp that breaks into three 1-seeded cocci.

The history of *Galphimia* is one of confusion, caused in part by misinterpretation of the earliest described taxa, competing generic names (*Galphimia* Cav. vs. *Thryallis* L.), and misapplication of various names to one cultivated species (*G. gracilis*), but also by the superficial morphological similarity of many of the species. The showy inflorescences catch the eye of collectors, who often label all specimens from Mexico as *G. glauca* or *G. gracilis*, and those from South America as *G. brasiliensis*. This revision builds on preliminary studies of the genus (C. Anderson 2003, 2005a, b) and clarifies the circumscriptions of the species and associated nomenclature. It is intended as a basis for detailed future studies. Many species are still known from only few collections. Questions remain concerning the phylogeny, phylogeographic history, pollination and dispersal strategies, ploidal levels, as well as developmental aspects, such as the nature of the unusual calyx glands, the shift to persistent petals, and the suppression of the peduncle.

### TAXONOMIC HISTORY

The nomenclature of *Galphimia* and the application of names have been problematical, partly owing to uncertainty about the status of the generic name *Thryallis* L. and partly to doubtful interpretation of original descriptions without access to type

material. Now *Thryallis* Mart. has been conserved over *Thryallis* L., a synonym of *Galphimia* Cav., and the opportunity to study types allows for assignment of names as intended by the original authors.

The taxonomic history of the genus now accepted as *Galphimia* begins with Linnaeus's (1762) description of his new genus *Thryallis*, containing only *T. brasiliensis*. In 1799 Cavanilles published the genus *Galphimia* (an anagram of *Malpighia*) to accommodate two species from Mexico (*G. glauca*, *G. hirsuta*) to which he added *G. glandulosa* in 1801. Lindley (1828) and Martius (1829) added new species from Brazil to *Thryallis*, and Martius also provided a generic description reflecting his concept of *Thryallis*. It was Adrien de Jussieu (1833), the first monographer of the Malpighiaceae, who realized that *T. brasiliensis* is not congeneric with Lindley's *T. brachystachys* and Martius's *T. longifolia* and *T. latifolia*. He transferred *T. brasiliensis* to *Galphimia* Cav., as *G. brasiliensis* (L.) Adr. Juss., and recognized *Thryallis* sensu Martius, in which he included *T. longifolia*, *T. latifolia*, and *T. brachystachys* (Jussieu 1840).

Most botanists followed Jussieu's lead in recognizing *Galphimia* and *Thryallis* sensu Martius (e.g., Grisebach 1858) until Kuntze (1891) opted to retain *Thryallis* L. for all the species that had been placed in *Galphimia* and proposed the new genus *Hemsleyana* to replace *Thryallis* sensu Martius. Kuntze's views were accepted most notably by Rose (1909) and Small (1910), but they were rejected by Niedenzu (1914, 1928), who accepted Jussieu's generic classification. The controversy was not settled until a proposal by Morton and Cuatrecasas (1967) to conserve *Thryallis* sensu Martius over *Thryallis* L. was accepted by the Nomenclature Section of the 11th International Botanical Congress in 1969. *Thryallis* Mart. thus is now included in the list of conserved names of the *International Code of Botanical Nomenclature* (McNeill et al. 2006). It is a South American genus of five species not associated with the Galphimieae (C. Anderson 1995). Yet, the confusion concerning the correct generic name persists, particularly in the horticultural trade, and names in *Thryallis* are still used occasionally for species of *Galphimia*.

Only two authors provided comprehensive accounts of *Galphimia* after Jussieu's (1843) treatment and Rose's (1909) brief synopsis: Small in 1910 (as *Thryallis*) for the series *North American Flora* (thus excluding the South American taxa), and Niedenzu (as *Galphimia*) in 1914 as a monograph and in 1928 as part of his treatment of Malpighiaceae for *Das Pflanzenreich*. Regrettably, the work of both authors was hindered by a paucity of good collections and a lack of opportunity to study the majority of types. As a result, their publications are flawed and, as primary references, contributed to the many misunderstandings of species circumscriptions and nomenclature that have plagued all those concerned with *Galphimia* since the early part of the 20th century.

At the time that Jussieu defined *Galphimia*, the genus included only the three species of Cavanilles in addition to *G. brasiliensis*. To these Bartling (1840) added *G. gracilis*, *G. grandiflora*, and *G. paniculata* (his names *G. latifolia* and *G. humboldtiana* are synonyms of *G. paniculata*) and Jussieu (1843) described *G. multicaulis* in his monograph of the family. Explorations of southern South America and of the American West and Mexico in the late 1800s and early 1900s resulted in the discovery of additional species from those regions. Chodat (1890) described *G. australis* and *G. platyphylla* from Paraguay. By the time Rose (1909) published his review of the genus (as *Thryallis*) five more species were known from Mexico: *G. angustifolia* (including *G. linifolia*; also in Texas), *G. montana*, *G. sessilifolia*, *G. tuberculata* (including *G. humilis*), and *G. vestita*; however, the Oaxacan endemic *G. elegans*, which Baillon (1874) based on cultivated plants, was overlooked. Blake (1917) described another

Mexican species, *G. langlassei* (as *Thryallis langlassei*). My studies (C. Anderson 2003, 2005a, b) added one new species from Paraguay (*G. amambayensis*) and five from Mexico (*G. arenicola*, *G. mexiae*, *G. mirandae*, *G. oaxacana*, *G. radialis*); three new species, *G. calliantha* from Guerrero, *G. floribunda* from western Mexico, and *G. speciosa* from southern Mexico and Central America, are proposed here. *Galphimia* now includes 26 species.

## MORPHOLOGY

*Habit and vesture.* Most species of *Galphimia* are shrubs that may reach 4 m and some form treelets (to 6 m), but those without peduncles are mostly large, often sprawling, suffrutescent herbs arising from a woody base or small shrubs to 1.5 m high.

In most species the vesture is composed of medifixed, straight to wavy or crisped, reddish brown, sessile or subsessile hairs to ca. 1 mm long. In a few species the medifixed hairs are borne on persistent tubercles, which roughen the structure after the hair is shed (Fig. 4c). Such tubercles may be strongly expressed, as in *G. tuberculata*, or subtly and then are seen only with magnification, as in *G. brasiliensis* and the petioles of *G. gracilis*. Basifixed hairs occur on the ovary and fruit of some species with deciduous petals. The hairs may be evenly distributed (but sometimes absent near the apex) or restricted to the sutures.

In general, the stems and foliage are pubescent when very young but soon become glabrescent to glabrous at maturity; the inflorescence axes are commonly moderately to densely pubescent but also eventually glabrescent in age. *Galphimia glandulosa* and *G. floribunda* lack such vesture; *G. glandulosa* is entirely glabrous (except for a pilose ovary), and *G. floribunda* may have only some scattered hairs on parts of the inflorescence or lack them. *Galphimia gracilis* is unusual in that the laminas have a tuft of hairs at the apex; this tuft is sloughed off in age and seen best in younger leaves. Three species are easily recognized by the vesture of the vegetative parts. In *G. elegans*, the laminas are abaxially pubescent with reddish brown hairs, which may be sloughed off, and older leaves may be only patchily pubescent or eventually glabrescent. Younger leaves are also adaxially sparsely pubescent, but the hairs are soon shed. Frequently the epidermis is raised at the point of attachment, which is evident after the hair has fallen. *Galphimia vestita* and *G. hirsuta* are abundantly pubescent in all parts, including the abaxial surfaces of the calyx and the petals. *Galphimia hirsuta* is covered with hairs borne on persistent tubercles. In *G. vestita* the dense tangled covering is composed of white or translucent T-shaped hairs, which have a trabecula 1–2 mm long borne on a stalk ca. 0.5 mm long. Such hairs do not occur in any other species of *Galphimia*, although they are found in many other genera of Malpighiaceae.

*Leaves.* Most collections of *Galphimia* consist of the inflorescence and subtending shoot, but only occasionally include leaves from other parts of the plant, which are often larger than those near the flowers. Thus, for some species the measurements given in the descriptions may not reflect the full range of leaf dimensions. The leaves are opposite and, in most species, petiolate, although the petioles may be very short; in species lacking peduncles and also one species with persistent petals, *G. multicaulis*, petioles generally are much less than 1 cm long. In *G. sessilifolia* the petioles are absent or rudimentary (to 1 mm long). In the majority of species the laminas vary from elliptical to lanceolate to ovate, and in some to rhombic (e.g., *G. tuberculata*).

*Galphimia vestita* has linear leaves less than 1 cm wide. In two widespread species, *G. angustifolia* and *G. australis*, laminas are exceptionally variable in shape, from linear to ovate, sometimes on the same individual (Fig. 15a).

The margin is entire, but in species bearing tuberculate hairs the margin of mature leaves, at least proximally, bears the persistent tubercles. The laminas of *G. arenicola* commonly bear elongate, multicellular, epidermal processes in addition to such tubercles along the margin. *Galphimia oaxacana* is distinctive in that the margin forms a thickened, narrow, light-colored band.

All species have circular leaf glands, which are often diagnostic, especially their size and position, except in *G. speciosa*, in which the placement of the leaf glands is variable, even along the same shoot (Fig. 27c). In general, a pair of glands is borne on the lamina margin, near or at the base, or on the petiole, mostly in the distal 1/2. *Galphimia glandulosa* is distinctive in that the leaf glands are usually borne in the proximal 1/6–1/2 of the petiole (Fig. 7b, c). The glands may be flush with the surface or barely raised (e.g., *G. gracilis*, Fig. 1b), but more commonly are prominent (e.g., *G. langlassei*, Fig. 9b) to peglike (e.g., *G. tuberculata*, Fig. 4b, e). Sometimes, one or more smaller additional glands are found along the margin, distally from the main pair, and sometimes one or both glands are absent. In *G. sessilifolia* only the first pair of leaves on a shoot has one or two glands (Fig. 13b), though sometimes it, too, is eglandular; this first pair also differs from other leaves on the same shoot in having relatively small, orbicular laminas.

The stipules are distinct, intrapetiolar, linear to narrowly triangular (e.g., Fig. 1b, 20b), and persistent on the stems. In most species, stipules are 1–3 mm long, but in *G. radialis* they are commonly 3.5–6 mm long (Fig. 12c) and in *G. vestita* 3.5–9 mm long (Fig. 17b).

**Inflorescences.** The basic pattern in *Galphimia*, as in many genera of Malpighiaceae, is a single flower on a pedicel, which is borne on a peduncle; this unit represents a reduced inflorescence. A pair of bracteoles subtends the pedicel; in many genera the bracteoles are borne at the base of the pedicel, but in *Galphimia* they are found on the peduncle, near the apex (e.g., *G. gracilis*, Fig. 1c) or, more commonly, between the base and the apex of the peduncle (e.g., *G. grandiflora*, Fig. 34c). A bract always subtends the base of the peduncle. Bracts and bracteoles are persistent. In six species the peduncle is lost or rudimentary, and the pedicel is then subtended by three structures, the bract and the pair of bracteoles (e.g., *G. angustifolia*, Fig. 15f, j; *G. vestita*, Fig. 17h); in *G. angustifolia* and *G. brasiliensis* the peduncle is mostly not evident but sometimes expressed in some inflorescences. The bracts and bracteoles are persistent; they are eventually sloughed off in old inflorescences.

The 5-merous, bilaterally symmetrical flowers are borne in terminal racemes, which are solitary in most species or grouped in ternate panicles, especially in robust individuals. In a few species, e.g., *G. paniculata*, the racemes are aggregated into large panicles, and most of the flowers are crowded along the axes. In species lacking peduncles the flowers are more widely spaced, often separated by a distance approximating the length of the pedicel (e.g., Figs. 15a, 18a); except in *G. platyphylla*, the small flowers characteristic of these species and their opening only one to three at a time add to the sparser appearance of the raceme when compared to the inflorescences of the remainder of the genus. In species with persistent petals the flowers are usually closely spaced along the axes, and among these species the persistent petals add to the dense aspect of the inflorescences (e.g., Figs. 33a, 36a).

The inflorescence axes are sparsely to densely pubescent during anthesis, but the vesture may be abraded or sloughed off in age. The peduncles and pedicels are also

usually somewhat pubescent, and within an inflorescence the pedicels are commonly more densely so than the peduncles. Frequently, the line indicating the articulation between the pedicel and peduncle is covered with a dense ring of hairs. In many species the pedicels have the hairs concentrated in a line extending from the calyx to the peduncle. Two species are distinctive in their lack of vestiture in the inflorescence: *G. glandulosa*, which is entirely glabrous (except for a pilose ovary), and *G. floribunda*, in which the racemes are glabrate (with a few scattered hairs) to glabrous.

*Calyx.* The calyx is composed of five oblong to elliptical sepals, which may be distally minutely denticulate or minutely erose and sometimes ciliate; in *G. calliantha* the margin is fringed. The sepals are mostly glabrous, but pubescent in *G. amambayensis*, *G. hirsuta*, and *G. vestita*. The species lacking peduncles all have a tuft of hairs at the apex of the sepal (e.g., *G. angustifolia*, Fig. 15f); this tuft is seen best in buds and recently opened flowers.

*Galphimia* lacks the oil glands that are found on the calyx of most genera of New World Malpighiaceae, and most species have large anthers, which are associated with pollination syndromes in which pollen is the reward. Yet, some species have glands at the base of the sinus between adjacent sepals (e.g., Figs. 3d, 7d, 20c), which resemble the leaf glands in appearance and not the oil glands found in other genera. The nature of these glands in *G. australis* (as "*G. brasiliensis*") was investigated by Castro et al. (2001).

Calyx glands occur only in nine species, all with deciduous petals (*G. arenicola*, *G. glandulosa*, *G. hirsuta*, *G. montana*, *G. oaxacana*, *G. mirandae*, and *G. tuberculata* in Mexico, and *G. australis* and *G. platyphylla* in South America). The expression of calyx glands is often unstable, and only *G. hirsuta* has five calyx glands in every flower; however, *G. hirsuta* is known from only three collections. In *G. arenicola*, *G. glandulosa*, and *G. oaxacana* the number of glands per calyx varies from one to five. In *G. australis*, *G. montana*, *G. platyphylla*, and *G. tuberculata* some or all flowers in an inflorescence may lack calyx glands or bear one to five glands. Only one calyx of one specimen of *G. mirandae* bore one gland, but for this species, too, only limited material is available.

*Corolla.* The corolla is composed of five clawed petals, which are yellow, but often marked or suffused with red, and glabrous, but with hairs on and adjacent to the abaxial midrib in *G. hirsuta* and *G. vestita*, two species characterized by abundant vestiture, and in *G. amambayensis*. In the majority of species, the petals are deciduous. Eight species (*G. calliantha*, *G. elegans*, *G. floribunda*, *G. glauca*, *G. grandiflora*, *G. multicaulis*, *G. paniculata*, *G. speciosa*) have persistent petals, which stiffen as the fruit matures and remain even after the cocci have fallen (e.g., Fig. 31d). Surprisingly, none of the authors who have published on *Galphimia* remarked on this highly unusual phenomenon, even though some (e.g., Cavanilles 1799; Bartling 1840; Baillon 1874) observed living plants cultivated in botanical gardens.

The basic corolla pattern is four equal lateral petals and one posterior petal (the "flag" petal) with a longer and stouter claw and differently shaped limb. The species lacking peduncles all have subequal petals, i.e., the posterior petal is like the lateral ones though sometimes a little bit larger. Except for *G. platyphylla*, these species have very small petals, the limb only to 5 mm long. Only one species with peduncles has subequal petals, *G. radialis*.

*Androecium.* The androecium is composed of ten glabrous stamens. The filaments are of unequal length. The filament opposite the anterior sepal is the longest,

that opposite the posterior petal the shortest; the lateral filaments are of intermediate length. Only *G. brasiliensis* and *G. vestita* depart from this pattern. In *G. brasiliensis* the filaments of stamens opposite the lateral sepals are equal to each other and only slightly shorter than that opposite the anterior sepal, and the filaments of stamens opposite all petals are equal. In *G. vestita* the filaments are all equally long. Adjacent filaments are usually very briefly connate at base.

The anthers are subequal within an androecium and open by longitudinal slits. In most species they range from 2.5 to 3.5 mm long (*G. elegans*: 1.8–2 mm; *G. glandulosa*: 3.3–4.4 mm), but in species lacking peduncles they are much shorter (*G. angustifolia*, *G. brasiliensis*: 0.7–0.9 mm long; *G. amambayensis*, *G. australis*, *G. platyphylla*, *G. vestita*: 1–1.5 mm long).

*Gynoeceum.* The ovary is tricarpellate and bears three subequal, subulate styles with a terminal minute stigma. Two carpels are anterior and one posterior, on the plane of symmetry. The ovary is always glabrous in species with persistent petals. Ten species have a pilose ovary; in seven the hairs are evenly distributed (*G. amambayensis*, *G. angustifolia*, *G. brasiliensis*, *G. glandulosa*, *G. langlassei*, *G. mexiae*, *G. vestita*), but in three the hairs are concentrated along the sutures (*G. oaxacana*, *G. radialis*, *G. tuberculata*). Ovary pubescence is variable in *G. montana*; in some specimens the ovaries bear some hairs along the sutures and in others they are glabrous. The hairs are basifixed and in most species ca. 0.1–0.3 mm long and thus easily overlooked, especially in species with hairs mostly on the sutures; in *G. radialis* the hairs are up to 0.8 mm long.

*Fruits.* The fruit is a schizocarp that breaks into three cocci. Each pebble-like coccus contains a globose seed with a dark brown, smooth seed coat. The globose to ellipsoid embryo is folded in half, the larger outer cotyledon enfolding the smaller inner one. Cocci generally are from 3 to 5 mm long, but only 2.5 mm long in *G. glauca*. The cocci are smooth to somewhat rugose when dry, and glabrous or minutely pilose (like the ovaries), and lack any obvious dispersal mechanism. They fall into the "detritus fruit" category, i.e., small pebble-like units blown about by wind or dispersed by water. In herbarium specimens with mature fruits, the cocci are often slightly dehiscent along the dorsal suture, although the opening is not sufficient to release the seed; it is not known whether this dorsal splitting is natural or an artifact of drying. The base of the coccus and the areole often have some aerenchyma, which may provide some buoyancy.

## DISTRIBUTION

*Galphimia*, in general, occurs in dry habitats and has an unusual range. The majority of species are found in Mexico, with one (*G. speciosa*) extending into Central America and another (*G. angustifolia*) into Texas. The Mexican species are recorded mostly from dry situations in pine-oak forests and shrublands ("matorral") and also disturbed areas. Only *G. grandiflora* occurs in mesic sites in forests dominated by oaks, pines, and firs. *Galphimia arenicola* has been found only on dunes and in coastal deciduous forest on the Pacific coast of the Isthmus of Tehuantepec. See the appendix for a list of species found in Mexico and sorted by state.

Four species are found in South America, south of the Amazon basin (Figs. 19, 21), all in open habitats (open woodlands and grasslands, cerrado, caatinga, campo limpo, campo sujo, matorral, and secondary sites). *Galphimia australis*, a widespread and variable species found from eastern Bolivia and southern Brazil to northern

Argentina, is sympatric with *G. amambayensis* (known only from the type from eastern Paraguay) and *G. platphylla* (eastern Paraguay and adjacent Brazil). *Galphimia brasiliensis* is restricted to eastern Brazil, from Paraíba to Bahia and adjacent Piauí. The South American species are morphologically most similar to *G. angustifolia* and *G. vestita* of northern Mexico, which grow in dry and desert habitats, from thorn scrub and tropical deciduous forest to sandy washes and arroyos; *G. angustifolia* is also reported from limestone, caliche, and gypsum substrates. *Galphimia angustifolia* is a common species found from central Texas to Tamaulipas and west to Coahuila (and some collections from the Durango border) as well as in eastern Baja California Sur and westernmost Sonora and adjacent Sinaloa (Fig. 16). The range of *G. vestita* extends from Sonora to Nayarit, with one collection from southwestern Chihuahua (Fig. 10).

### GENERIC AND INFRAGENERIC AFFINITIES

The phylogeny of Malpighiaceae and the relationships of the genera are currently the focus of a study by W. R. Anderson and C. C. Davis; earlier results were reported by Cameron et al. (2001) and Davis et al. (2001). *Galphimia* is placed in the tribe Galphimieae of subfamily Byrsonimoideae, with *Lophanthera* Adr. Juss., *Spachea* Adr. Juss., and *Verrucularia* Adr. Juss. (W. R. Anderson 1978). In addition to the shared characteristics noted by Anderson (1978), the presence of latex has been reported for all four genera (*Lophanthera*, *Spachea*: W. R. Anderson 1981, 2001; *Galphimia*, *Verrucularia*: Vega et al. 2002). In a review of chromosome numbers of Neotropical Malpighiaceae, W. R. Anderson (1993) noted that  $n=6$  is the lowest number reported for the family and that  $n=6$  or a multiple of 6 is typical for members of subfamily Byrsonimoideae. Counts reported for *Lophanthera* and *Verrucularia* are  $n=6$ ; none are known for *Spachea*. Few counts are available for *Galphimia*, but they indicate that also in *Galphimia*  $x=6$ . W. R. Anderson (1993) predicted that the low number and morphological evidence place the Galphimieae near the base of the family phylogeny, a position confirmed by Cameron et al. (2001) and Davis et al. (2001).

Two vouchered counts of *G. gracilis* are  $n=12$ . Of these only one was obtained from buds collected in the field (Fryxell & Anderson 3483; W. R. Anderson 1993) and the only one for which I saw the voucher. MacBryde (1970) also cited a voucher for his cultivated source (MacBryde & Herrera-MacBryde 63). Literature reports of counts  $n=12$  from cultivated plants of *Galphimia* most likely apply to *G. gracilis*; however, garden specimens of Malpighiaceae are often mislabeled even to genus, and in the absence of vouchers the identity of sources remains uncertain. Lombello and Forni-Martins (2002) report  $2n=24$  for "*G. brasiliensis*." The voucher (Lombello 50, UEC, not seen) was collected from plants cultivated in Campinas and likely represents *G. gracilis* or perhaps *G. australis*. MacBryde (1970) and Semple (1970) listed in the same summary of chromosome reports differing counts for *G. angustifolia*. MacBryde cited  $n=12$  (voucher: Lynch 710, MO!) and Semple listed  $n=20$  (voucher: MacBryde 72, not seen). Both vouchers were prepared from transplanted individuals collected in Texas. Three vouchered counts for "*G. glauca*," all  $n=6$ , have been published for two species with persistent petals: *G. floribunda* (voucher: Breedlove 19114, Seavey 1975) and *G. speciosa* (voucher: Breedlove 7072, Kyhos 1966; voucher: Anderson 13555, W. R. Anderson 1993). A very preliminary molecular survey of species of *Galphimia* (C. C. Davis, pers. comm.) indicates that *G. gracilis* may be basal to the rest of the genus. It is intriguing that species with persistent petals, which are presumed to be among the more recently derived in the genus, have a lower chromosome number than the two species with deciduous petals.

A reliable phylogeny of *Galphimia* is not yet available; therefore, the species of *Galphimia* are here assigned to three informal groups and within these groups are placed according to morphological similarity. Groups II and III may prove to form derived clades. It is possible that the two North American species and the four South American species of Group II represent two separate migrations; possibly *G. brasiliensis*, which differs notably from the other three South American taxa, represents a third event.

Group I comprises 12 species from Mexico and is the most diverse. All species have deciduous petals and well-developed pedicels and peduncles. In all but *G. radialis* the posterior petal differs from the lateral ones. Some species have an entirely or partially pilose ovary and fruit, and some have a glandular calyx. Four species (*G. arenicola*, *G. gracilis*, *G. hirsuta*, *G. tuberculata*) have the vestiture composed of hairs borne on persistent tubercles; this condition is not as strongly expressed in *G. gracilis* as in the other three. Three species have relatively long, elongate laminas with the glands borne on the margin (never on the petiole); of these, *G. langlassei* and *G. mexiae* have pilose ovaries, but in *G. radialis* such hairs are found only on the sutures.

Group II includes the four South American species, and two from northern Mexico (*G. angustifolia* into Texas, *G. vestita*). In all, the peduncle is lost or rudimentary, and the wand-like, elongate racemes bear widely spaced flowers with subequal petals; usually only one to three flowers are open at the same time (up to seven in *G. platyphylla*). The sepals bear an apical tuft of hairs, which is eventually sloughed off. The flowers, except in *G. platyphylla*, are small, with petals only to 5 mm long, and all have small anthers, to 1.5 mm long. The ovary and fruit are glabrous only in *G. australis* and *G. platyphylla*, the only species with calyx glands. *Galphimia vestita* has linear leaves, a shape found also in the variable *G. angustifolia* and *G. australis* but in no other species in the genus. *Galphimia brasiliensis* is the only species of this group with hairs borne on persistent tubercles.

Group III comprises eight species that have persistent petals. The flowers are closely spaced along the inflorescence axis, and the crowded aspect of the racemes is enhanced by the large petals, which are retained beyond maturation of the fruit. All species have well-developed peduncles, an eglandular calyx, and a glabrous ovary and fruit. The lateral petals are of a different shape and size than the posterior one. Overall, the flowers are the largest in the genus. The limb of the petals is mostly longer than 7 mm and in *G. grandiflora* it measures to 15.5 mm long. These eight species may be the most recently derived. They share an overall similar aspect and are the taxa most often misdetermined; many collectors label any specimen with persistent petals "*G. glauca*."

## TAXONOMY

Note: Measurements of floral parts were taken from flowers rehydrated with Pohl's solution (Pohl 1965).

**Galphimia** Cav., Icon. 5: 61. 1799. *Malpighia* [subgenus] *Galphimia* (Cav.) Persoon, Syn. pl. 1: 506. 1805.—LECTOTYPE, designated by O'Donell and Lourteig, 1943: *Galphimia glauca* Cav.

*Thryallis* L., Sp. pl. (ed. 2) 554. 1762, nom. rej., non *Thryallis* Martius, 1829, nom. conserv. *Vorstia* Adanson, Fam. pl. 2: (23). 1763, nom. superfl. *Galphimia* sect. *Microgalphimia* Nied., Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunschweig 5: 21. 1914, nom. superfl.—TYPE: *Thryallis brasiliensis* L. [= *Galphimia brasiliensis* (L.) Adr. Juss.].



Suffrutescent herbs arising from a woody base, subshrubs, shrubs, or treelets. Leaves opposite, petioled or subsessile to sessile; lamina linear, lanceolate, elliptical, ovate, rhombic, obovate, or occasionally suborbicular, apex acute or apiculate, base acute, attenuate, cuneate, or truncate, narrowly decurrent or not, glabrous (pubescent in *G. hirsuta* and *G. vestita*, sparsely so in *G. elegans*), margin entire (with tubercles in *G. arenicola*, *G. gracilis*, *G. hirsuta*, and *G. tuberculata*, with elongate multicellular outgrowths in *G. arenicola*), costa prominent abaxially, secondary veins prominent or prominulous or not evident; stipules distinct, intrapetiolar, linear or narrowly triangular, persistent on stems. Leaf glands usually 2 and paired, disklike and prominent or flush with the surface, or peglike and stalked, borne in the proximal portion of the lamina on the margin near or at the base, or borne on the petiole, the pair of glands subopposite or separated, sometimes with additional glands on the laminar margin or with only 1 gland, or sometimes glands absent. Inflorescence a terminal raceme or a panicle; flowers borne on a pedicel, peduncles present and subtended by a bract and bearing a pair of bracteoles, the articulation commonly marked with a ring of hairs, or peduncle absent or rudimentary and the pedicel subtended by a bract and a pair of bracteoles. Flowers bilaterally symmetrical. Sepals 5, oblong, elliptical, or lanceolate, eglandular or with a gland at the base of the sinus between all or some adjacent sepals. Petals 5, clawed, subequal or the posterior petal (the "flag") differing from the lateral ones, glabrous (pubescent on the midvein abaxially in *G. hirsuta* and *G. vestita*, also sometimes in *G. amambayensis*), yellow and often suffused with red, deciduous or persistent, the limb elliptical to ovate or triangular. Stamens 10, glabrous, filaments differing in length (equal in *G. vestita*), that opposite the anterior sepal the longest, those opposite the posterior and posterior-lateral petals the shortest, anthers subequal, dehiscent by longitudinal slits. Ovary spherical, tricarpellate (2 carpels anterior, 1 carpel posterior), trilocular (all 3 locules fertile), glabrous or finely pilose with basifixed hairs; styles 3, subulate, glabrous; stigma minute, terminal. Fruit a schizocarp, splitting into 3 cocci, these glabrous or pilose like the ovary, carpophore absent; seed coat shiny (dark) brown; embryo globose or subglobose, radicle straight, cotyledons oblong and folded at the proximal 2/3–2/5, the outer cotyledon larger than and enclosing the inner one. Base chromosome number:  $x=6$ .

#### KEY TO THE SPECIES OF GALPHIMIA

1. Plants of South America.
  2. Sepals abaxially tomentose or patchily so in fruit; ovary and fruit pilose along the sutures and on the proximal 2/3 of the surface, the distal 1/3 glabrous; Paraguay (Amambay).
    17. *G. amambayensis*
  2. Sepals glabrous or with scattered hairs near the base and/or with a tuft of hairs at the apex; ovary and fruit glabrous or uniformly pilose.
    3. Ovary and fruit pilose; petioles 3–10 mm long, tuberculate-strigose, or in older leaves only the persistent tubercles remaining; Brazil (Bahia, Paraíba, Pernambuco, and adjacent Piauí).
      15. *G. brasiliensis*
    3. Ovary and fruit glabrous; petioles 1.5–6 mm long, glabrous.
      4. Laminas linear to linear-lanceolate to lanceolate to narrowly elliptical, (0.5–) 1–2.5 (–3.3) cm wide, length/width ratio (2–) 2.5–7 (–9); pedicels tomentulose or with scattered hairs or sometimes glabrous; sepals 2.5–3.5 (–4) mm long, 1–1.8 mm wide; petal limb 3–5 mm long; cocci 3–3.8 mm long; common in southern Brazil, eastern Bolivia, Paraguay, northeastern Argentina and adjacent Uruguay.
        16. *G. australis*
      4. Laminas elliptical, broadly lanceolate, ovate to broadly ovate, occasionally suborbicular, (1.5–) 2–4 (–5) cm wide, length/width ratio 1.2–2.3 (–3); pedicels glabrous; sepals 4–5.7 mm long, 2–2.5 mm wide; petal limb 7–8.5 mm long; cocci 4–5 mm long; Paraguay (Amambay, Caaguazú, Canendiyú) and adjacent Brazil (Mato Grosso do Sul).
        18. *G. platyphylla*

1. Plants of the U.S.A. (Texas; *G. angustifolia*), Mexico, and Central America (*G. speciosa*).
5. Inflorescence a terminal raceme with only 1-2 (-3) flowers open at one time, flowers widely spaced along the axis, usually the distance between flowers about as long or longer than the length of the pedicels; peduncles absent or rudimentary; petals deciduous, subequal; anthers 0.7-1.5 mm long.
6. Leaves glabrous or with a few scattered hairs; sepals glabrous except for an apical tuft of hairs (best seen in bud and young flowers); U.S.A. (Texas) and Mexico (Baja California Sur, Chihuahua, Coahuila, Durango, Nuevo León, San Luis Potosí, Sinaloa, Sonora, Tamaulipas).  
13. *G. angustifolia*
6. Leaves densely pubescent; calyx densely pubescent; southwestern Chihuahua, Nayarit, Sinaloa, Sonora.  
14. *G. vestita*
5. Inflorescence a terminal raceme or a panicle, more than 3 flowers open at one time, flowers closely spaced along the axis, the distance between flowers variable and shorter than the length of the pedicels; peduncles present; petals deciduous or persistent, the posterior petal differing from the lateral petals (petals subequal in *G. radialis*); anthers 1.8-4.4 mm long.
7. Petioles absent or rudimentary (up to 1 mm long); lamina base shallowly cordate or truncate; leaf glands present only on basal pair of leaves of a shoot, these leaves much smaller than the distal ones and suborbicular; Oaxaca.  
11. *G. sessilifolia*
7. Petioles present, at least 3 mm long; lamina base acute or cuneate or decurrent (sometimes truncate in *G. montana*); leaf glands not restricted to basalmost pair of leaves of a shoot.
8. Laminas abaxially pubescent, at least those close to the inflorescence.
9. Laminas all evenly pubescent on both surfaces; petals deciduous, often abaxially pubescent; calyx abaxially pubescent and glandular; Guerrero.  
4. *G. hirsuta*
9. Laminas, at least those close to the inflorescence, abaxially pubescent or patchily so in older leaves, adaxially only sparsely pubescent and glabrescent; petals persistent, glabrous; calyx with scattered hairs and eglandular; Oaxaca.  
20. *G. elegans*
8. Laminas glabrous or with a few scattered hairs.
10. Inflorescence axes, peduncles, and pedicels glabrous or with a few scattered hairs.
11. Petals deciduous, commonly suffused with red; calyx usually glandular; ovary and fruit pilose; leaf glands borne on the petiole in the proximal 1/6-1/2 (rarely distally); Guerrero, Jalisco, México, Michoacán, Sinaloa.  
7. *G. glandulosa*
11. Petals persistent, yellow; calyx eglandular; ovary and fruit glabrous; leaf glands borne on the margin of the lamina or near the apex of the petiole; Chihuahua, Durango, Jalisco, Sinaloa, Sonora, Nayarit.  
26. *G. floribunda*
10. Inflorescence axes, peduncles, and pedicels moderately to densely pubescent.
12. Petals persistent and spreading below the fruit, retained even after the cocci have fallen, limb of lateral petals 7.5-15.5 mm long; calyx glands absent; ovary and fruit glabrous.
13. Petioles rudimentary or very short, even in the largest leaves only 0.3-0.8 (-1) cm long; Guanajuato, Jalisco, Michoacán and adjacent México, disjunct to Oaxaca.  
22. *G. multicaulis*
13. Petioles well developed, (0.8-) 1-5 cm long (shorter only in smallest leaves of *G. glauca*).
14. Leaf glands borne at about the middle of the petiole (sometimes more distally in the smallest leaves near the inflorescence); Guerrero, Jalisco, México, Michoacán, Morcos, Nayarit, western Oaxaca, Puebla, Zacatecas.  
23. *G. paniculata*
14. Leaf glands borne on the margin of the lamina, or at or near the apex of the petiole.
15. Limb of lateral petals 10-15.5 mm long, 6-11 mm wide; sepals 4-5.5 mm long; bracts 3-6.7 mm long.
16. Sepals with a fringed margin; leaf glands a pair borne well above the base of the lamina, the glands sessile, ca. 0.5 mm in diameter, often with additional smaller glands distally; Guerrero.  
24. *G. calliantha*
16. Sepals with a glabrous margin; leaf glands a pair borne at the base of the lamina, often at the tip of a basal tooth, or at the apex of the petiole, each gland 0.6-1.3 mm in diameter, prominent to peglike (and then up to 1.5 mm long); Colima, Jalisco, México, Michoacán, Morelos.  
25. *G. grandiflora*
15. Limb of lateral petals 7-9.5 (-10) mm long, 5-8.5 mm wide; sepals 2.5-4 mm long; bracts 1.5-3 (-4) mm long.

17. Leaf glands borne above the base of the lamina, often at the apex of a tooth; limb of lateral petals elliptical to lanceolate, limb of posterior petal broadly triangular; cocci ca. 2.5 mm long, ca. 2 mm in diameter; inflorescence a terminal raceme; Aguascalientes, Guanajuato, Hidalgo, Jalisco, Nuevo León, Querétaro, San Luis Potosí, Tamaulipas, Zacatecas. 19. *G. glauca*
17. Leaf glands borne at the base of the lamina and/or the distal portion of the petiole, commonly variable among the leaves of a branchlet; limb of lateral petals triangular to ovate, limb of posterior petal broadly triangular to suborbicular; cocci 3.5–4 mm long, ca. 3 mm in diameter; inflorescence a terminal raceme or leafy ternate panicle; Mexico (Chiapas, Oaxaca, Puebla, Veracruz), Guatemala, Honduras, and adjacent Nicaragua. 21. *G. speciosa*
12. Petals deciduous, limb of lateral petals 4.5–8.5 mm long; calyx glands present or absent; ovary and fruit pilose or glabrous.
18. Petals subequal, the posterior petal only slightly larger than the lateral petals; ovary and fruit with hairs on the sutures and in the proximal 1/4–1/2, the hairs up to 0.8 mm long; stipules up to 0.6 mm long; Guerrero. 10. *G. radialis*
18. Petals unequal, the posterior petal differing from the lateral petals in size and shape; ovary and fruit glabrous or with hairs up to 0.3 mm long; stipules to 0.3 mm long.
19. Ovary and fruit evenly pilose over the entire surface.
20. Anthers 3–4 mm long; filament of stamen opposite the anterior sepal 3.5–4.5 mm long, filament of stamen opposite the posterior petal shorter than that of stamens opposite the posterior-lateral sepals (1.6–2.6 mm vs. 3.5–4.6 mm); limb of lateral petals 6–7 mm long, 4.5–5.5 mm wide; peduncles 0.6–1.2 (–1.6) times as long as pedicels; Colima, Guerrero, Jalisco, Michoacán. 8. *G. langlassei*
20. Anthers 2.3–2.5 (–2.8) mm long; filament of stamen opposite the anterior sepal 2.2–3 mm long, filaments of stamens opposite the posterior petal and posterior-lateral sepals subequal [1.5–1.7 (–2) mm vs. 1.5–1.8 (–2.2) mm]; limb of lateral petals 4.5–6 mm long, 3.7–4.7 mm wide; peduncles 0.3–0.5 (–0.7) times as long as pedicels; northwestern Jalisco and adjacent Nayarit. 9. *G. mexiae*
19. Ovary and fruit glabrous, or with hairs only on the sutures (in *G. tuberculata* also in the basal 2/3).
21. Secondary veins of lamina not or barely evident abaxially; ovary glabrous.
22. Pedicels 14.5–18.5 mm long; peduncles 0.2–0.3 times as long as pedicels; sepals 3.5–4.2 mm long; laminas elliptical to broadly so, obovate, rhombic, ovate, or suborbicular, the base often decurrent; Guerrero, Puebla. 12. *G. mirandae*
22. Pedicels 2–10 mm long; peduncles 0.5–3 times as long as pedicels; sepals 2.5–2.8 mm long; laminas narrowly lanceolate to narrowly elliptical to elliptical, the base not decurrent (or slightly so in *G. arenicola*).
23. Margin of lamina entire; bracteoles borne at or just below the apex of the peduncle; pedicels 5–10 mm long, peduncles 0.5–1 times as long as pedicels; limb of posterior petal 7–8.5 mm long; Tamaulipas, San Luis Potosí, and Veracruz, and adjacent regions of Hidalgo, Puebla, and Querétaro. 1. *G. gracilis*
23. Margin of lamina (at least near the base) with scattered tubercles and/or somewhat longer epidermal processes; bracteoles borne in the proximal 1/4–1/2 of the peduncle; pedicels 2–5 mm long, peduncles 1.2–3 times as long as the pedicels; limb of posterior petal ca. 4.5 mm long; coastal Oaxaca. 6. *G. arenicola*
21. Secondary veins of lamina evident abaxially, prominent to prominent; ovary with hairs on sutures (or glabrous in *G. montana*).

24. Vegetative parts with hairs borne on persistent tubercles and/or only with the tubercles (the hairs already shed); branchlets commonly roughened by persistent tubercles; peduncles 1–2.2 times as long as pedicels: Colima, Guerrero, Jalisco, Nayarit, Sinaloa.
5. *G. tuberculata*
24. Vegetative parts with sessile hairs or glabrous; branchlets smooth or the bark lightly fissured; peduncles 0.2–0.8 times as long as pedicels.
25. Laminas thick-textured (coriaceous when dried), abaxially papillose or the epidermis at least blistered, the margin a thickened light-colored band to 0.2 mm wide; secondary veins prominent abaxially; ovary and fruit with hairs on sutures Pacific slope of Oaxaca. 3. *G. oaxacana*
25. Laminas thin-textured (papery when dried), abaxially smooth, the margin not thickened; secondary veins evident to prominent abaxially; ovary and fruit with hairs on sutures or glabrous: Colima, Guerrero, Jalisco, Michoacán, Nayarit, Sinaloa, and southwestern Durango and Zacatecas. 2. *G. montana*

GROUP I (petals deciduous; peduncles present)

**I. *Galphimia gracilis*** Bartling, *Linnaea* 13: 552, 1840 ["1839"]. *Thryallis gracilis* (Bartling) Kuntze, *Rev. gen. pl.* 1: 89, 1891.—TYPE: based on plants cultivated in the botanical garden of Göttingen (holotype: unknown).—NEOTYPE, designated by Cuatrecasas and Croat, 1981: a specimen prepared from plants cultivated at the botanical garden in Paris (P-JU 11510, microfiche: MICH!, photo: MICH!).

*Galphimia gracilis* var. *gracillima* Hieronymus, *Bot. Jahrb. Syst.* 20, Beibl. 49: 36, 1895.—TYPE: COLOMBIA, Cauca; specimens cultivated in Cerrito, *Lehmann 7439* (lectotype, designated by Cuatrecasas and Croat, 1981: F; isoelectotypes: GH! K! S! US!).

Fig. 1.

Shrub or subshrub to 4 m; stems strigose to tomentulose, becoming glabrate to glabrous in age. Vesture of all vegetative parts of straight to wavy, reddish brown hairs 0.3–0.6 (–0.9) mm long, subsessile or each hair borne on a persistent tubercle to 0.05 mm high, hairs on the petiole borne on a persistent tubercle up to 0.1 mm high. Laminas of the larger leaves 2.5–7 cm long, 2–3 cm wide, elliptical or narrowly elliptical, apex apiculate and with a tuft of hairs in young leaves (sometimes retained in mature leaves), base acute, glabrous or with a few hairs scattered on the costa abaxially, secondary veins not or barely evident, margin entire; petioles 0.7–1.5 cm long, tomentulose to glabrate, irregularly tuberculate; glands usually a pair borne on the margin of the lamina 2–10 mm above the base or sometimes with 3–4 glands, each gland 0.3–0.4 mm in diameter, disklike and prominent or flush with the margin, or sometimes peglike and ca. 0.1 mm long; stipules 1.3–3.2 mm long, 0.4–0.7 mm wide, linear, with scattered hairs at the apex and along the margin. Inflorescence a terminal raceme, the axes tomentulose or strigose; peduncles 3–6.3 mm long, pedicels 5–10 mm long, both tomentulose or strigose, peduncles 0.5–1 times as long as pedicels; bracts 2.5–3 mm long, 0.6–0.8 mm wide, linear, bracteoles 1.4–2 mm long, 0.3–0.5 mm wide, linear, bracts and bracteoles glabrous or with scattered hairs along the margin; bracteoles subopposite or up to 0.5 mm apart, usually borne at or just below the apex of

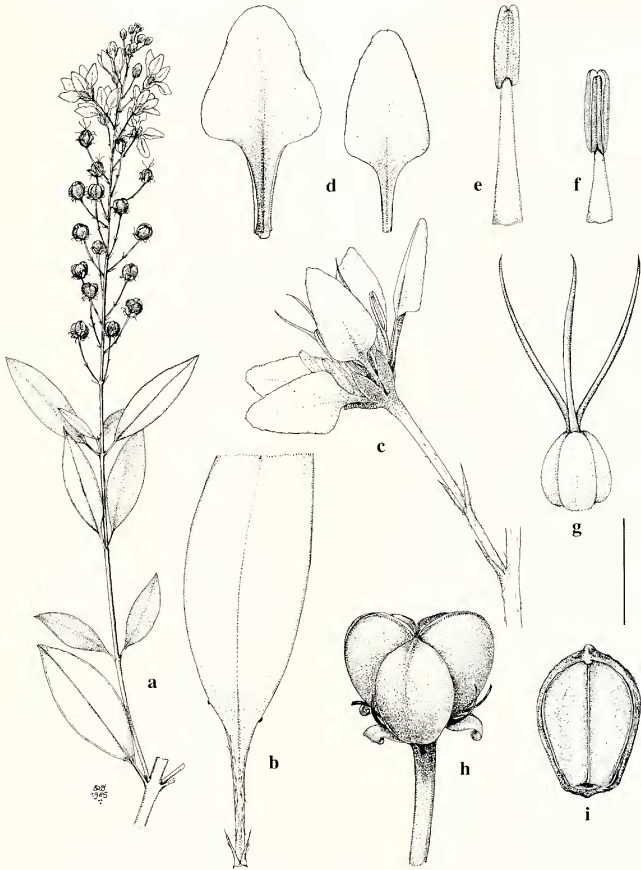


FIG. 1. *Galphimia gracilis*. a. Flowering and fruiting branch. b. Base of leaf and stipules, adaxial view. c. Flower, side view, posterior petal at upper right. d. Posterior petal (left) and lateral petal (right), adaxial views. e. Stamen from opposite sepal, abaxial view. f. Stamen from opposite petal, adaxial view. g. Gynoecium. h. Fruit. i. Coccus, adaxial view. Scale bar: a, 3 cm; b, c, 6 mm; d, h, 4.2 mm; e-g, i, 3 mm. (Based on Fryxell & Anderson 3484, MICH.)

the peduncle. Sepals 2.5–3.2 mm long, 1.2–1.5 mm wide, elliptical or oblong, margin denticulate-erose in distal 1/2, glabrous; glands absent. Petals decussate, unequal, yellow or the claws suffused with red, glabrous, margin erose to irregularly denticulate and with scattered fimbriae; lateral petals: claw 2–2.5 mm long, 0.5–0.7 mm wide, limb 6–7 (–8.5) mm long, 4–4.6 (–5) mm wide, narrowly elliptical to narrowly ovate, apex obtuse, base acute; posterior petal: claw 4–5 mm long, 1–1.5 mm wide, limb 7–8.5 mm long, 6–7 (–8) mm wide, broadly triangular, apex broadly obtuse, base truncate. Stamens of unequal length: filament opposite anterior sepal (4.2–) 4.5–5 mm long, filaments opposite anterior-lateral petals 3–4 mm long, filaments opposite anterior-lateral sepals 4–5.2 mm long, filaments opposite posterior-lateral petals 2–3 mm long, filaments opposite posterior-lateral sepals 3.5–4 mm long, filament opposite posterior petal 2–2.3 mm long; anthers 2.3–3 mm long. Ovary glabrous; styles (5–) 6–7 mm long, Coccus 4.5–5 mm long, 3–3.3 mm in diameter, glabrous; areole 3.5–3.7 mm long, 2.8–3 mm wide; outer cotyledon 3–4 mm long, inner cotyledon 2.4–3 mm long. Chromosome number:  $n=12$  (W. R. Anderson 1993).

Phenology. Collected in flower throughout the year (except March and October), in fruit in January and February and from April through September.

Distribution (Fig. 2). Mexico (Hidalgo, Puebla, Querétaro, San Luis Potosí, Tamaulipas, Veracruz); deciduous lowland forest, acahuales, roadsides, often in wet situations, such as streambanks and ditches, commonly cultivated and adventive outside the natural range; 20–900 m.

REPRESENTATIVE SPECIMENS. **Mexico.** HIDALGO: Mpio. Huejutla, Tehuetlán, *Hernández M. et al.* 6385 (CAS, ENCB, MEXU, MO, XAL); Mpio. Huejutla, near Huejutla, *Seler & Seler* 660 (GH, US).—PUEBLA: Mpio. Metlatoyuca, Metlatoyuca, *Torra* 2337 (ENCB).—QUERÉTARO: Jalpan, al oriente de Tanchanaquito, El Sabinito, *López* 366 (IEB, MICH).—SAN LUIS POTOSÍ: Mpio. San Antonio, Tanjasnec, *Alcorn* 1836 (MEXU, TEX); S of Villa Juárez, *Clark* 6837 (MO); Mpio. Ciudad Valles, 2 mi W of Chontal, on Rancho Pago Pago, *Fryxell & Anderson* 3484 (CAS, CHAPA, DUKE, ENCB, MBM, MEXU, MICH, NY, TEX); 2 mi E of Tamazunchale, N side of river, *Hitchcock & Stanford* 7318 (DS, UC, US); 2 mi N of Tanquián, *Johnston & Crutchfield* 5675 (LL, MEXU, MICH, TEX); Tamazunchale, *Lundell* 7145 (MICH, US); Valles, *Lundell & Lundell* 7275 (LL, MEXU, MICH, NY, US); San Dieguito, *Pulner* 104 in 1904 (F, GH, K, MO, NY, UC, US); Rascon Station, *Pringle* 3099 (A, BM, BR, ENCB, F, G, GH, GOET, LL, MEL, MEXU, MO, NY, S, TEX, UC, W); Huichihuayán, *Rzedowski* 7819 (ENCB, MEXU, TEX).—TAMAULIPAS: near Limón, 73 mi S of Ciudad Victoria, *Frye & Frye* 2665 (DS, GH, MICH, MO, NY, UC, US); 3 km al E de Nuevo Morelos, *González Medrano* 12187 (MEXU, MO); Chancal, Ocampo Rd, *Kenoyer & Crum* 3579 (GH, MICH); 10 km al S de Llera, *Puig* 5212 (ENCB, MICH).—VERACRUZ: Tantoyuca, *Berlundier* 2149 (G, GH, NY); Mpio. Tempoal, El Mirador, presa Paso de Piedras, 21°31'N 98°07'W, *Calzada et al.* 6217 (ENCB, F, IEB, MEXU, XAL); Mpio. Tepetzintla, San José Copaltitla, 7 km al NE de Tepetzintla, *Castillo C. & Benavides* 2294 (F, MEXU, XAL); Mpio. Ozuluama, *Castillo C. et al.* 270 (F, IBUG, MICH, XAL, WIS); along Hwy 180 between Tampico and Pozarica, 12 mi N of Ozuluama, 38 km N of Naranjos, *Croat* 66092 (CAS, MICH, MO); Mpio. Pánuco, 1.7 km WNW of Hwy Mex-70, 10 km E of Ebano, 22°12'N, 98°17'W, *Diggs & Nee* 2572 (F, MICH, NY, XAL); Mpio. Chicontepec, carr. a Benito Juárez, 3 km antes de Benito Juárez, 20°54'N, 98°13'W, *Durán E. et al.* 264 (XAL); Wartenberg, near Tantoyuca, prov. Huasteca, *Ervenberg* 130 (G, GH, GOET); 13 mi S of Tampico, Hwy 180 to Tuxpan, *Lasseigne* 4897 (ENCB, MEXU, MICH, MO, NY, WIS); 36 mi N of Tantoyuca on Rte 120, *Ozment et al.* 388 (WIS); road from Tamiagua to Tuxpan, about 6 mi S of Tamiagua, *Tucker* 2060 (DUKE, ENCB); Mpio. Alto Lucero, carr. Santa Ana–Los Atlixos, 19°52'N, 96°32'W, *Vázquez* B. 1818 (XAL).

*Galphimia gracilis* is an attractive shrub native to eastern Mexico. The shoots appear reddish owing to the vestiture, composed of straight to wavy hairs that are subsessile or borne on persistent tubercles ca. 0.05 mm high, but to 0.1 mm high on the petioles. The narrowly elliptical to elliptical laminas have an apical tuft of hairs (sloughed off in age) and glands on the margin placed well above the base. The bracteoles are usually borne at or near the apex of the peduncle.

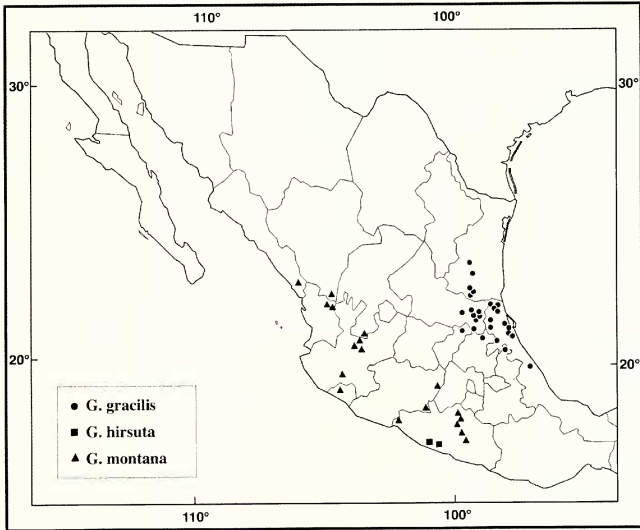


FIG. 2. Distribution of *Galphimia gracilis* and *G. montana*.

The names *Galphimia gracilis* (and *Thryallis gracilis*) have been widely misapplied to many other species of *Galphimia* of Mexico, particularly to those with deciduous petals. *Galphimia gracilis* also is often confused with the partly sympatric *G. glauca*, which is easily separated by its persistent petals and smaller fruits (2.5 mm long vs. 4.5–5 mm long in *G. gracilis*). *Galphimia glauca* also differs in its bracteoles (placed well below the apex of the peduncle) and lack of tubercles; the laminas vary from elliptical to lanceolate or ovate to rarely suborbicular, whereas the laminas of *G. gracilis* are only elliptical or narrowly so. Small (1910) included *G. gracilis* within his very broadly circumscribed *Thryallis glauca*.

*Galphimia gracilis* is widely cultivated in warm regions, as “goldshower” and “shower-of-gold” (and equivalents in local languages), and also as “thryallis.” It is frequently adventive and occasionally locally naturalized. The species was introduced to gardens as “*Galphimia glauca*” (e.g., Maund 1837). In horticultural publications, in the nursery trade, and on websites, *G. gracilis* is often listed and pictured as “*Galphimia glauca*,” “*Galphimia brasiliensis*,” “*Thryallis glauca*,” and “*Thryallis gracilis*.” See also the discussion under *G. glauca*.

Bartling (1840) based *G. gracilis* on living plants grown at the botanical garden in Göttingen, and no authentic material is known. Given the many well-prepared collections available for this species, it is unfortunate that a fragmentary garden specimen in the Jussieu herbarium was chosen as neotype.

2. *Galphimia montana* (Rose) Nied. in Engler, Pflanzenreich IV, 141: 601. 1928. *Thryallis montana* Rose, Contr. U.S. Natl. Herb. 12: 281. 1909.—TYPE: MEXICO, Durango: Sierra Madre near Huazamota (fide McVaugh, 1972), 15 Aug 1897, Rose 2309 (holotype: US!; isotypes: MEXU! NY!).

*Galphimia glauca* f. *parvifolia* Nied., Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 5: 25. 1914.—TYPE: MEXICO, Jalisco: slopes of the barranca of Guadalajara, 4500 ft, 8 Aug 1902, Pringle 9698 (holotype: B, destroyed; lectotype, designated by Cuatrecasas and Croat, 1981: NY!; isotypes: F, GH! K! L! MEXU! MO! NY! US!).

Shrub or treelet to 3.5 m; stems and branchlets sparsely tomentulose when very young, soon glabrous. Vesture of all vegetative parts composed of sessile, straight or wavy to crisped, reddish brown hairs 0.2–0.6 mm long. Laminas of the larger leaves 2–5 (–5.5) cm long, 1–3 cm wide, lanceolate to ovate to orbicular, apex apiculate, base acute or sometimes truncate, glabrous, secondary veins always evident and usually prominulous abaxially, margin entire; petioles 0.4–1.5 cm long, glabrate or glabrous; glands usually a pair borne on the margin at or near the base of the lamina or to 10 mm above the base or sometimes 1 or both glands borne on the petiole, sometimes with only 1 gland or glands absent, each gland 0.4–0.6 mm in diameter, disklike and prominent, or peglike and up to 0.7 mm long; stipules 1–2.5 mm long, 0.3–1 mm wide, linear to narrowly triangular, glabrous. Inflorescence a terminal raceme, the axes sparsely tomentulose to glabrate; peduncles 2–5 mm long, sparsely tomentulose, pedicels 5.5–10.5 mm long, glabrate or sparsely tomentulose, peduncles 0.2–0.6 times as long as pedicels; bracts 1.5–3 mm long, 0.4–0.5 mm wide, linear, bracteoles 1–1.5 (–2) mm long, 0.2–0.4 mm wide, linear, bracts and bracteoles glabrous; bracteoles subopposite or to 2 mm apart, borne at about the middle of the peduncle, or only 1 bracteole borne at the middle and the other near the base or in the proximal 1/4–1/3. Sepals 2.4–3 mm long, 1–1.4 mm wide, oblong, glabrous, margin denticulate (–ciliate) in the distal 1/2; glands 0–3 (–5?) per calyx, 0.2–0.5 mm in diameter, sessile to 0.3 mm long. Petals deciduous, unequal, glabrous, yellow, the claws suffused with red, margin irregularly denticulate/fimbriate; lateral petals: claw 1.2–2.2 mm long, ca. 0.5 mm wide, limb 5.5–6.8 (–7.5) mm long, 3.5–4.2 mm wide, elliptical or narrowly lanceolate, apex obtuse, base attenuate; posterior petal: claw 3–4 mm long, 1–1.5 mm wide, limb 5–6.5 mm long, 4.5–6 mm wide, broadly triangular or sometimes suborbicular, apex broadly rounded, base truncate or slightly cordate. Stamens of unequal length; filament opposite anterior sepal 3–3.7 mm long, filaments opposite anterior-lateral petals 2.6–3 (–3.5) mm long, filaments opposite anterior-lateral sepals 2.5–3.1 (–3.5) mm long, filaments opposite posterior-lateral petals 1.5–2 mm long, filaments opposite posterior-lateral sepals 2.7–3.2 (–3.5) mm long, filament opposite posterior petal 1.5–2 mm long; anthers (2.2–) 2.5–3 mm long. Ovary glabrous or pilose only on the sutures; styles 4–5 mm long. Coccus 3–3.5 mm long, 2.6–2.8 mm in diameter, glabrous or pilose only on the sutures; areole ca. 3 mm long, ca. 2.3 mm wide; outer cotyledon 2–2.3 mm long, inner cotyledon 1.5–1.7 mm long. Chromosome number unknown.

Phenology. Collected in flower and fruit from July through December.

Distribution (Fig. 2). Mexico (Colima, southern Durango, Guerrero, Jalisco, Michoacán, Nayarit, southern Sinaloa, southern Zacatecas); tropical low deciduous forest (“selva baja caducifolia,” “bosque tropical deciduo”); 150–1200 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** COLIMA: 11–12 mi by rd S of Colima, rd to Manzanillo, 19°05'N, 103°47'W, Webster & Breckon 16116 (MEXU).—GUERRERO: Mpio. Ahuacatzingo, cerca de Trapiche Viejo, 40 km al NE de Chilapa, Acosta & López 73 (MICH); Guayameo, Ditto, Minas, Hinton



*et al.* 9372 (DS, F, GH, MEXU, MICH, NY, US); Mpio. Tepecoacuilco, 33 km al S de Iguala Terracería a Coacoyula, *Koch & Fryxell 8246* (CAS, CHAPA, ENCB, MEXU, MICH, NY); Río Balsas, *Orcutt 4183* (BM, DS, F, GH, MEXU, MO, US); hillsides near Balsas Station, *Pringle 10063* (BM, C, CAS, F, G, GH, GOET, L, MEXU, MICH, MO, NY, S, U, C, US, W).—JALISCO: Mpio. San Cristóbal de la Barranca, Km 37 adelante del pueblo de San Cristóbal Barranca, *Ornelas U. & Cházaro B. 767* (CHAPA, ENCB, IBUG); barranca near Guadalajara, *Palmer 97* in 1886 (BM, G, GH, K, MEXU, MICH, MO, NY, US); between Bolaños and Guadalajara, *Rose 3050* (NY, US); Mpio. Tuxcacuesco, 5–6 km WSW de Tuxcacuesco, Cerro del Palacio, 19°40'40"N, 104°01'10"W, *Santana M. & Rosales 6494* (MICH, WIS); Mpio. Amatitán, Barranca Santa Rosa, orilla Río Santiago, *Villarreal 6658* (IBUG).—MICHOACÁN: Dtto. Zitácuaro, *Hinton 13220* (BM, DS, ENCB, F, GH, MEXU, MICH, NY, S, U, C, US); Mpio. Huetamo, Mal Paso, *Hinton et al. 8039* (A, BM, F).—NAYARIT: Mpio. Nayar, Jesús María, camino a La Mesa, cerca del arroyo El Fraile, *Colunga & Zizumbo 32* (CAS, MEXU); valley of the Río Jesús María near village of Jesús María, *Feddema 1243* (MICH); Mpio. Nayar, 3.9 km al NE de Jesús María, camino a Huejuquilla, 22°16'N, 104°30'W, *Flores F. 1059* (MEXU, MICH, MO); Cañón de Jesús María, Tepic, *Goldsmith 159* (F, GH, MO, UC, US); Mpio. Acaponeta, near Jesús María, *Norris & Taranto 13961* (IEB, MICH); Mpio. Nayar, 7 km al W de Jesús María, carr. a la Mesa del Nayar, 22°15'N, 104°38'W, *Ramírez R. 442* (IEB, MICH, MEXU, MO); Mpio. Nayar, El Puente, 12 km al NW de Jesús María, carr. a La Mesa del Nayar, 22°15'N, 104°33'W, *Tenorio L. 16570* (MEXU, MICH, MO).—SINALOA: Mpio. San Ignacio, San Agustín, *González Ortega 526 p.p.* (MEXU); rd to Microondas la Palma, 1.3 mi E of Hwy 15, this junction 26 mi S of Hwy 40 junction S of Mazatlán and 1.5 mi N of Rosario, *Reveal 4021* (K, MICH, MO); Mpio. Concordia, Cerro del Ocote, *Trejo & Dehesa 1085* (F, US).—ZACATECAS: Mpio. Moyahua, Santa Rosa, Cerro La Garruñera, *Enríquez E. 136* (MEXU); Mpio. Moyahua, San Lorenzo, Cerro de Las Anonas, *Enríquez E. 48* (IBUG, MEXU).

*Galphimia montana* is a graceful shrub or treelet of the deciduous woodlands of western Mexico, which shows considerable variation throughout its range. The slender shoots bear thin-textured lanceolate to ovate to orbicular leaves; the glands may be borne on the margin of the lamina or at/near the apex of the petiole. The calyx may be eglandular or have 1 or more glands. The ovary and fruit is usually glabrous, but occasionally each carpel/coccus bears a row of hairs along the dorsal suture; *G. montana* is the only species in the genus that exhibits such variability in ovary vestiture. In its habit *G. montana* resembles *G. sessilifolia*, endemic to Oaxaca and named for the distinctive coriaceous sessile leaves.

Collections of *G. montana* are often confused with *G. gracilis*, which is native to eastern Mexico but widely cultivated and often adventive. Both have deciduous petals, but *G. gracilis* differs in its larger flowers lacking calyx glands, larger glabrous fruits (4.5–5 mm long, 3–3.3 mm in diameter), elliptical laminas that bear a tuft of hairs at the apex, and bracteoles usually borne at or near the apex of the peduncle. In *G. montana* hairs are sessile, whereas in *G. gracilis* they are often attached to a tiny persistent tubercle; the petioles are usually roughened by such tubercles. Specimens of *G. montana* have also been misdetermined as *G. glauca*, which has persistent petals; Niedenzu (1914) even described a collection of *G. montana* as a form of *G. glauca* (f. *parvifolia*). Two other species with deciduous petals from western Mexico with which *G. montana* might be confused are *G. langlassei* and *G. mexiae*. Both have densely pilose ovaries and fruits, and lack calyx glands.

**3. *Galphimia oxacana*** C. Anderson, Contr. Univ. Michigan Herb. 24: 15. 2005.—TYPE: MEXICO, Oaxaca: Dtto. Tehuantepec, Rancho Ricardo, al N de Buenos Aires, entrando por Hierba Santa, 12 Sep 1985, *Torres C. 7306* (holotype: MICH!; isotypes: F! MEXU!). Fig. 3.

Shrub or treelet to 6 m; stems and branchlets sparsely pubescent when young, soon glabrous. Vestiture of all vegetative parts of sessile, straight to wavy, reddish brown hairs 0.3–0.8 mm long. Laminas of the larger leaves 3.5–6 cm long, 1.5–3.5 cm wide, elliptical or ovate to lanceolate, apex apiculate or sometimes acute, base acute, glabrous, abaxially papillose or sometimes only slightly so (the epidermis at

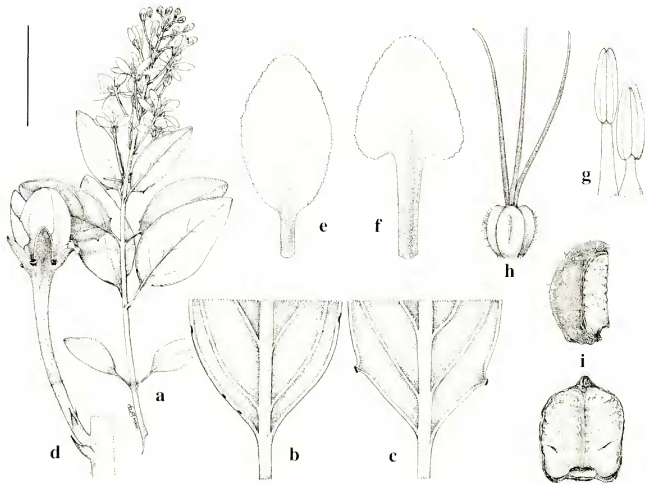


FIG. 3. *Galphimia oaxacana*. a. Flowering branch. b, c. Proximal portion of two leaves, abaxial view. d. Flower bud, opening, borne on pedicel and peduncle, with portion of inflorescence axis; note calyx glands. e. Lateral petal. f. Posterior petal. g. Stamens, adaxial view, opposite posterior petal (right) and posterior-lateral sepal (left). h. Gynoecium. i. Cocci, lateral view (above) and adaxial view (below). Scale bar: a, 4 cm; b-d, 8 mm; e, f, 5 mm; g, 4 mm; h, 2.7 mm; i, 3.3 mm. (Based on: a, b, g, i, *Martínez R. 55*, MICH; c-f, h, *Torres C. 122*, MEXU.)

least blistered), thick and coriaceous when dried, secondary veins (at least the first two pairs) prominent abaxially (usually appearing white in dry material); margin entire, thickened; petioles 0.8–1.5 cm long, glabrous or with a few scattered hairs; glands usually a pair borne on the margin of the lamina 8–15 mm above the base or sometimes with 3–6 glands, each gland 0.4–0.7 mm in diameter, disklike and prominent, or sometimes flush with the margin; stipules 1.5–2.5 mm long, 0.8–1 mm wide, narrowly triangular, glabrous. [Sometimes shrubs with only the terminal branches bearing a flush of small leaves along short internodes (to ca. 1 cm long) and a short inflorescence, the leaves 1–2.5 cm long, 0.5–0.9 cm wide; see discussion.] Inflorescence a terminal raceme, the axes sparsely tomentulose or strigose; peduncles 3.5–6.5 mm long, pedicels (7–) 10–15 mm long, both sparsely tomentulose, peduncles 0.3–0.5 times as long as pedicels; bracts (1.5–) 2–2.8 mm long, 0.5–0.9 mm wide, linear, bracteoles 0.8–1.7 mm long, 0.3–0.6 mm wide, linear, bracts and bracteoles glabrous; bracteoles borne in the proximal 1/5–1/2 of the peduncle, subopposite. Sepals 2.5–3 mm long, 1.3–1.5 mm wide, oblong, glabrous, margin denticulate-ciliate in the distal 1/4; glands 1–3 (–5) per calyx, 0.3–0.5 mm in diameter, to 0.2 mm long. Petals deciduous, unequal, yellow, the claws suffused with red, glabrous, margin denticulate; lateral petals: claw (1.5–) 2–2.5 mm long, 0.5 mm wide, limb (5–) 6.5–8 mm long, (3.8–) 4–4.5 mm wide, elliptical to narrowly lanceolate, apex obtuse, base acute; posterior petal: claw (3–)

4–5 mm long, (1–) 1.2–1.5 mm wide, limb (4.5–) 5–6.5 mm long, (4–) 5.5–6 mm wide, triangular, apex broadly obtuse, base cordate. Stamens of unequal length; filament opposite anterior sepal 4–4.5 mm long, filaments opposite anterior-lateral petals 2.5–3 mm long, filaments opposite anterior-lateral sepals 3.6–4.2 mm long, filaments opposite posterior-lateral petals 1.5–2 mm long, filaments opposite posterior-lateral sepals 3.3–3.5 mm long, filament opposite posterior petal 1.5–2 mm long; anthers (2.5–) 2.8–3.5 mm long. Ovary pilose on the sutures, otherwise glabrous, hairs ca. 0.1 mm long; styles (4.7–) 5–5.3 mm long. Coccus ca. 3.5 mm long, ca. 2.7 mm in diameter, pilose on the sutures, otherwise glabrous; areole ca. 3 mm long, ca. 2.5 mm wide; mature seed not seen. Chromosome number unknown.

Phenology. Collected in flower from August to October, in fruit from September to December.

Distribution (Fig. 10). Mexico (Oaxaca, Pacific slopes of the Isthmus of Tehuantepec); in deciduous forest (“selva baja caducifolia”) and transition to pine-oak forest; 500–1100 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** OAXACA: alrededores del Cerro Guiengola, a 10 km aprox. al NW de Tehuantepec, *Cabrera 7413* (MEXU, MO); Dto. Santo Domingo Tehuantepec, Mpio. Mixtequilla, a 18 km de Mixtequilla, carretera a Paso Escondido, 16°27'N, 95°19'W, *Calzada 19255* (MEXU); Mpio. Santiago Laollaga, recorrido por el aguaje Coyol, al W de Laollaga, 16°34'N, 95°14'W, *Campos V. 4039* (F, MEXU, MO); Mpio. Santiago Laollaga, recorrido hacia y por el Arroyo de Hierba Santa, al E de Guichixu, brecha Laollaga–Guevea de Humboldt, 16°41'N, 95°16'W, *Campos V. 4129* (F, MEXU, MO); Dto. Tehuantepec, Mpio. Buenos Aires, Buenos Aires, rumbo a El Cerro Arenal, *Martínez R. 55* (IEB, MICH, MO); Dto. Tehuantepec, ruinas del Cerro Guiengola, *Torres C. 40* (MEXU, MO); Dto. Tehuantepec, “Las Palmitas,” ladera oriente del Cerro Guiengola, *Torres C. 122* (IEB, MEXU, MO); Dto. Tehuantepec, 11 km al W de la Chiviza, hacia Lachiguiri, *Torres C. 5717* (MEXU, MICH, XAL); Dto. Tehuantepec, 12.2 km al W de la Chiviza, hacia Lachiguiri, *Torres C. 5720* (F, MEXU); Dto. Tehuantepec, 11.3 km al N de La Chiviza, *Torres C. & Martínez 5880* (MEXU, MICH).

*Galphimia oaxacana* is known only from dry habitats on the Pacific side of the Isthmus of Tehuantepec. The leaves are coriaceous and have a thickened margin. The abaxial epidermis is generally papillose; the cells are at least slightly raised to give a blistered aspect. The costa and major secondary veins are abaxially very prominent and appear white in dried specimens. The collections *Torres C. 122*, *Torres C. 5717*, and *Torres C. & Martínez 5880* are unusual in that they consist of terminal branches bearing a flush of very small leaves along short internodes (to ca. 1 cm long) and a short inflorescence; the leaves are 1–2.5 cm long, 0.5–0.9 cm wide. Except for size, these collections match *G. oaxacana* in all aspects, and this growth form may reflect particularly dry growing conditions. The only other species found in the Isthmus of Tehuantepec is the coastal *G. arenicola*, which has membranous leaves, lacks calyx glands, and has a glabrous ovary and fruit; it differs most notably in the presence of elongate epidermal processes on the laminar margin and hairs borne on persistent tubercles.

- 4. *Galphimia hirsuta*** Cav., Icon. 5: 62. May 1799. *Malpighia hirsuta* (Cav.) Persoon, Syn. pl. 1: 506. 1805 [combination also proposed by Poirlet in Lamarck, Encycl., Suppl. 4: 6. 1816]. *Galphimia hirsuta* f. *rufa* K. Koch, Berliner Allg. Gartenzeitung 1857(50): 394. 1857, nom. superfl. *Thryallis hirsuta* (Cav.) Kuntze, Rev. gen. pl. 1: 89. 1891.—TYPE: MEXICO. Guerrero: inter Chilpancingo et Rio Azul, *Neé s.n.* (holotype: MA-475693, microfiche: MICH!, photo: MO!; possible isotypes: BM! MA-475694, microfiche: MICH!).

Shrub to 1 m; stems pubescent when young, becoming glabrous but roughened by tubercles. Vesture of all vegetative parts of straight or crisped, reddish brown hairs 0.5–1.8 mm long, each hair borne on a persistent tubercle up to 0.1 mm high. Laminas of the larger leaves 5–7.5 cm long, 2–3 cm wide, lanceolate to elliptical to rhombic, apex apiculate, base cuneate-decurrent, pubescent, secondary veins prominulous abaxially, margin entire, evenly pubescent on both surfaces; petioles 0.2–1 cm long, pubescent, in older leaves some or all hairs abraded and only the tubercles persistent; glands a pair borne on the margin at or near the base of the lamina, each gland 0.2–0.4 mm in diameter, peglike, 0.4–0.6 mm long; stipules 2.5–3 mm long, 0.5–0.7 mm wide, linear, abaxially with scattered hairs. Inflorescence a terminal raceme, the axes pubescent; peduncles 5–7.3 mm long, pedicels 4.5–6.2 mm long, both pubescent, peduncles 0.9–1.3 times as long as pedicels; bracts 2.2–3 mm long, 0.5–0.7 mm wide, linear, bracteoles 1.4–1.6 mm long, 0.4 mm wide, linear, bracts and bracteoles with scattered hairs abaxially and along the margin; bracteoles borne at about the middle of the peduncle, subopposite or up to 1 mm apart. Sepals ca. 2.5 mm long, ca. 1 mm wide, oblong, pubescent, margin ciliate; glands 5 per calyx, 0.4–0.5 in diameter, to 0.3 mm long. Petals deciduous, unequal, yellow, with scattered hairs on the claw and midvein abaxially, margin finely denticulate; lateral petals: claw 2–2.2 mm long, 0.4–0.5 mm wide, limb 6.5–7 mm long, 4–4.5 mm wide, narrowly triangular, apex obtuse, base cordate; posterior petal: claw ca. 3.5 mm long, ca. 1.3 mm wide, limb 5.5–6 mm long, ca. 6 mm wide, broadly triangular, apex obtuse, base truncate. Stamens of unequal length: filament opposite anterior sepal ca. 3.8 mm long, filaments opposite anterior-lateral petals ca. 3.6 mm long, filaments opposite anterior-lateral sepals ca. 3.2 mm long, filaments opposite posterior-lateral petals ca. 2.2 mm long, filaments opposite posterior-lateral sepals ca. 3 mm long, filament opposite posterior petal ca. 2.5 mm long; anthers 3.3–3.5 mm long. Ovary glabrous; styles ca. 5.5 mm long. Mature fruit not seen.

Phenology. Collected in flower and immature fruit in July and September.

Distribution (Fig. 2). Mexico (Guerrero); pine-oak forest; 100–1000 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** GUERRERO: Dillo, Galeana, Atoyac, *Hinton 14533* (GH, MICH, NY, US); ca. 20 mi N of San Luis de la Loma, *Rowell 3144* (MICH).

*Galphimia hirsuta* differs from all but one other species of *Galphimia* in that it is pubescent in nearly all its parts (only the androecium and gynoecium are glabrous). The vesture is composed of hairs borne on tubercles, which persist and give a roughened aspect to older parts. The laminas vary from lanceolate to elliptical to rhombic and bear a pair of peglike glands on the margin at or near the cuneate-decurrent base. The only other species in the genus that is entirely pubescent is *G. vestita* of northern Mexico, but the hairs are not borne on tubercles; it also differs from *G. hirsuta* in its linear laminas, lack of peduncles, much smaller subequal petals, and pilose ovaries and fruits. *Galphimia hirsuta* might be confused with the more widely distributed and perhaps sympatric *G. tuberculata*, which is also characterized by persistent tubercles and calyx glands, but that species is easily separated by its essentially glabrous leaves and calyx, and the pubescent ovary and fruit.

The likely isotype at BM consists of a flowering shoot and bears the note "misit amicis. Zea"; the specimen apparently belonged to the Roemer herbarium, which came to the BM holdings as part of the Shuttleworth herbarium.

Earlier students of *Galphimia* (e.g., Bartling 1840; Jussieu 1843; Rose 1909; Niedenzu 1914, 1928) misapplied the name *G. hirsuta* to specimens of *G. elegans*, a Oaxacan endemic with persistent petals and abaxially sparsely pubescent laminas, which had been introduced to botanical gardens in the 1800s; see that species (no. 20).

- 5. *Galphimia tuberculata*** (Rose) Nied. in Engler, Pflanzenreich IV, 141: 602. 1928. *Thryallis tuberculata* Rose, Contr. U.S. Natl. Herb. 12: 281. 1909.—TYPE: MEXICO. Sinaloa: between Rosario and Colomas, 12 Jul 1897, *Rose 1607* (holotype: US!, photos: A! F! NY!; isotypes: NY-fragment! GH!).
- Thryallis humilis* Rose, Contr. U.S. Natl. Herb. 12: 280. 1909. *Galphimia humilis* (Rose) Nied. in Engler, Pflanzenreich IV, 141: 601. 1928.—TYPE: MEXICO. Nayarit: road between Concepción and Acaponeta, Territorio de Tepic, 29 Jul 1897, *Rose 1907* (holotype: US!, photos: A! F! NY!; isotype: NY!).

Fig. 4.

Shrub or subshrub to 2 m; stems tuberculate-strigose when young, in age only the tubercles remaining. Vestiture of all vegetative parts of wavy to crisped, reddish brown hairs 0.3–1.9 mm long, borne on a persistent tubercle up to 0.2 (–0.5) mm high. Laminae of the larger leaves 3.8–7.5 cm long, 1.4–3 cm wide, elliptical or lanceolate or rhombic, apex acute or apiculate or sometimes obtuse-apiculate, base cuneate-decurrent, glabrous or with scattered hairs on the midrib abaxially, in older leaves the midrib and also the margins near the base with tubercles only, secondary veins prominent or prominulous abaxially; petioles 0.2–1.2 cm long, tuberculate-strigose or only the tubercles remaining; glands borne on the margin 0.5–2 mm above the base of the lamina or rarely at the base, usually a pair or sometimes only 1 gland, each gland 0.2–0.5 mm in diameter, peglike, (0.2–) 0.5–1.2 (–1.6) mm long, or the glands absent; stipules (1.5–) 2–3.6 mm long, 0.5–1.2 mm wide, linear, glabrous or with scattered hairs along the margin. Inflorescence a terminal raceme, the axes tuberculate-strigose like the stems; peduncles 4.5–11 mm long, pedicels 2.5–7 mm long, both tuberculate-strigose, peduncles 1–2.2 times as long as pedicels; bracts 2.5–4.5 mm long, 0.5–0.8 (–1) mm wide, linear, bracteoles 1.1–2.6 mm long, 0.3–0.5 mm wide, linear, bracts and bracteoles glabrous or with scattered hairs at the apex and along the margin; bracteoles borne in the proximal 1/3–1/2 of the peduncle, subopposite or up to 3 mm apart. Sepals 3–3.7 mm long, 1.4–1.7 mm wide, oblong to narrowly elliptical, glabrous, the apex denticulate (–ciliate) or entire; glands 0–5 per calyx, 0.2–0.4 mm in diameter, usually 0.2–0.3 mm long or rarely on a spur up to 1.2 mm long. Petals deciduous, unequal, yellow or yellow marked with red, glabrous, margin subtire or finely denticulate; lateral petals: claw 2.2–3 mm long, 0.5–0.7 mm wide, limb 6–7.3 mm long, 4.5–6 mm wide, narrowly triangular (–ovate), apex obtuse, base truncate or cordate; posterior petal: claw 3.4–4.5 mm long, 1.4–2 mm wide, limb 6–6.5 mm long, 6–7.2 mm wide, broadly triangular, apex obtuse, base truncate to slightly cordate. Stamens of unequal length; filament opposite anterior sepal (2.5–) 3.2–4.5 mm long, filaments opposite anterior-lateral petals 3–4 mm long, filaments opposite anterior-lateral sepals 3–4 mm long, filaments opposite posterior-lateral petals 1.8–2.2 mm long, filaments opposite posterior-lateral sepals 3–3.5 mm long, filament opposite posterior petal (1.6–) 1.8–2.2 mm long; anthers (2.5–) 3–3.5 mm long. Ovary pilose, in the distal 1/3 only on the sutures, hairs ca. 0.1 mm long; styles (5.2–) 5.5–6.2 mm long. Coccus 3.5–4.5 mm high, ca. 3 mm in diameter, pilose, in the distal 1/3 only on the sutures; areole ca. 4 mm long, ca. 3 mm wide; mature seed not seen. Chromosome number unknown.

**Phenology.** Collected in flower in March and from May through September, and in fruit in March, May, July, and August.

**Distribution** (Fig. 5). Mexico (Colima, Guerrero, Jalisco, Nayarit, Sinaloa); deciduous forest, matorral, and in secondary vegetation; sea level to 400 m.

**REPRESENTATIVE SPECIMENS.** **Mexico.** COLIMA: coastal lowlands ca. 15 mi SE of Tecomán, rd to Coahuayana, Mich., ca. 2 mi from Río Coahuayana, *McVaugh 16070* (MEXU, MICH).—GUERRERO: Tecpan,

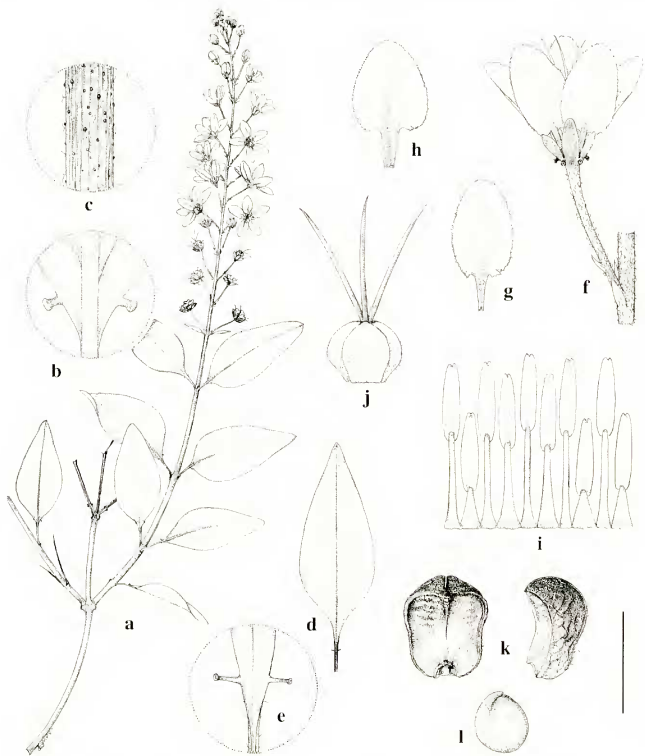


FIG. 4. *Galplúmia tuberculata*. a. Flowering branch. b. Base of lamina, abaxial view. c. Branch enlarged to show tubercles. d. Detached large leaf, adaxial view. e. Base of lamina in "d," adaxial view. f. Flower with subtending pedicel and peduncle and portion of inflorescence axis. g. Lateral petal. h. Posterior petal. i. Androecium laid out, abaxial view, the stamen at right opposite posterior petal. j. Gynoecium. k. Cocci, adaxial view (left) and lateral view (right). l. Seed. Scale bar: a, d, 4 cm; b, c, e, i-l, 4 mm; f-h, 8 mm. (Based on: a-c, f-j, McVaugh 16070, MICH; d, e, Ortega 6757, F; k, l, Lott 3741, MICH.)

torre de microondas cerca de Papanoa, 54 km al NW de Tecpan, Koch & Fryxell 82221 (CHAPA, ENCB, MEXU, MICH, NY); La Unión, Langlassé 255 (F, G, GH, P, US).—JALISCO: Punta Farallón, Bullock 2053 (CAS); Mpio. La Huerta, camino antiguo sur, Est. Biología Chamela, 19°30'N, 105°03'W, Lott 1739 (CAS, MICH, TEX, WIS); Mpio. La Huerta, Rancho Cuixmala, Cumbres 1, rd through deforested area, 19°31'N, 104°56'W, Lott 3741 (CAS, MICH).—NAYARIT: Mpio. Tepic, Vivero Forestal El Corte, Benitez-Paredes 3166 (MEXU); Mpio. Ruiz, 1-3 km W of El Venado, rd from Ruiz to Jesús María, Breedlove 45278 (CAS, MICH); Mpio. Huajicóri, 8 km al N de Huajicóri, carr. a Quiquinte, 22°43'N, 105°19'W, Ramírez 656 (IEB, MICH, MEXU, MO); Mpio. Acaponeta, Rose 1450 (NY, US).—SINALOA: Mpio. San Agustín, González Ortega 4001 (MEXU, US); Mazatlán, González Ortega 7271 (CAS, F, G, K, MEXU, US).

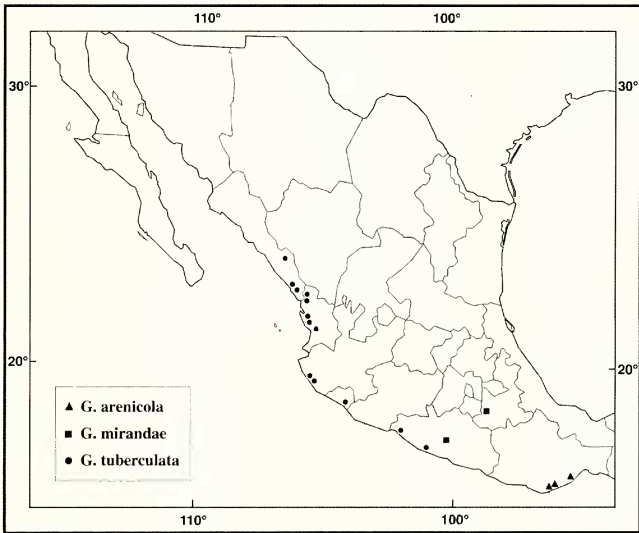


FIG. 5. Distribution of *Galphimia elegans*, *G. mirandae*, and *G. tuberculata*.

*Galphimia tuberculata* is named for the persistent tubercles that roughen the shoots and leaves after the hairs they bear are shed. Such tubercles are also found in *G. brasiliensis* (eastern Brazil), *G. gracilis* (eastern Mexico), and *G. hirsuta* (Guerrero), but they are most pronounced in *G. tuberculata* and the Oaxacan *G. arenicola*, both species of Pacific coastal lowlands. *Galphimia arenicola* differs in its smaller flowers, eglandular calyx, glabrous ovary and fruit, and the unusual multicellular processes that are found along the margin in the proximal part of the lamina. *Galphimia hirsuta* is known only from the lowlands of Guerrero and, like *G. tuberculata*, has a glandular calyx. It is named for the abundant vestiture that covers nearly all parts of the plant, whereas in *G. tuberculata* only the youngest parts and inflorescence axes are pubescent.

**6. *Galphimia arenicola*** C. Anderson, Syst. Bot. 28: 217. 2003.—TYPE: MEXICO. Oaxaca: Mpio. Tehuantepec, de Rincón Bamba a Garrapatero, Rincón Bamba se encuentra a 44 km al W de Salina Cruz, carr. a Pochutla, 15°59'N, 95°27'W, 31 Aug 1988, Martínez 1817 (holotype: MO!; isotypes: IEB! MEXU!).

Fig. 6.

Shrub to 4 m; stems pubescent when young, becoming glabrous but roughened by tubercles. Vestiture of all vegetative parts of straight to wavy, reddish brown hairs, 0.5–1 mm long, each hair borne on a persistent tubercle up to 0.1 mm high. Laminae

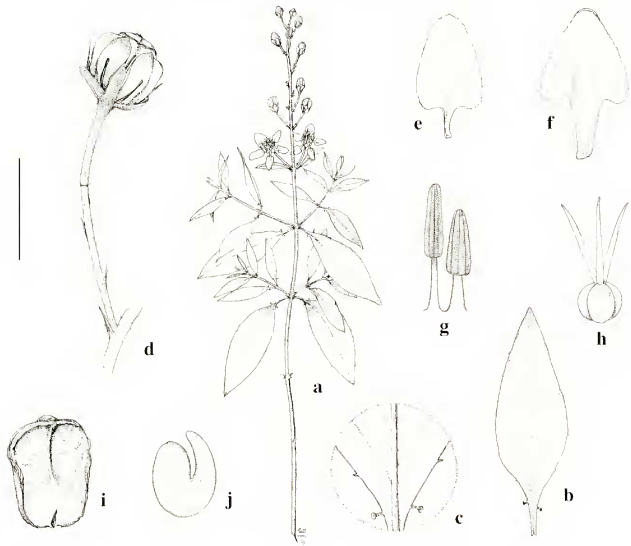


FIG. 6. *Galphimia arenicola*. a. Flowering branch. b. Leaf. c. Base of lamina, showing a pair of marginal leaf glands and marginal processes. d. Fruit borne on pedicel and peduncle, with portion of inflorescence axis. e. Lateral petal. f. Posterior petal. g. Stamens, adaxial view, opposite posterior petal (right) and posterior-lateral sepal (left). h. Gynoecium. i. Cocculus, adaxial view. j. Embryo. Scale bar: a, 4 cm; b, 2 cm; c, d, 8 mm; e, f, 5.7 mm; g-i, 4 mm; j, 2.7 mm. (Based on: a-c, *Martínez 1817, MO*; d-h, *Castillo C. et al. 9642, MEXU*; i, j, *Castillo C. et al. 9498, XAL.*)

of the larger leaves 2.5–4.8 cm long, 1–2 cm wide, narrowly lanceolate to narrowly elliptical, apex acute, base acute or slightly decurrent, adaxially glabrous, abaxially with scattered hairs (especially on the costa) when young but soon glabrous but with persistent tubercles, secondary veins only faintly evident abaxially, margin with irregularly spaced, elongate, multicellular, epidermal processes, similar to the tubercles but at least twice as long; petioles 0.4–1 cm long, very sparsely strigose to glabrous, roughened by persistent tubercles; glands a pair, borne on the margin 2–5 mm above the base of the lamina, rarely with 4 or 5 glands, each gland 0.4–0.5 mm in diameter, disklike and prominent, or peglike and up to 0.8 mm long, stipules 1.5–2.5 mm long, 0.5–0.7 mm wide, narrowly triangular to subulate, abaxially with scattered hairs and the margin ciliate. Inflorescence a terminal raceme, the axes tuberculate and strigose, peduncles 4–7.8 mm long, pedicels 2–5 mm long, both tomentulose, peduncles 1.2–3 times as long as pedicels; bracts 2.3–3 mm long, 0.5–0.6 mm wide, linear, bracteoles 1.3–1.7 mm long, 0.4 mm wide, linear, bracts and bracteoles glabrous or with scattered hairs along the margin; bracteoles borne in the proximal 1/4–1/2 of the peduncle, subopposite or up to 1 mm apart. Sepals 2.5–2.8 mm long, 1.4–1.6 mm wide, elliptical, glabrous or with scattered hairs near the base, margin denticulate-erose in the distal



1/2; glands absent. Petals deciduous, unequal, yellow and suffused with red, glabrous, margin denticulate; lateral petals: claw 2–2.3 mm long, 0.5–0.6 mm wide, limb 5–5.5 mm long, 3.3–4 mm wide, ovate to elliptical, apex obtuse, base truncate or slightly cordate; posterior petal: claw ca. 3.5 mm long, 1.6 mm wide, limb ca. 4.5 mm long, ca. 4.5–5 mm wide, triangular, apex broadly obtuse, base cordate to auriculate. Stamens of unequal length; filament opposite anterior sepal 3–3.5 mm long, filaments opposite anterior-lateral petals 2.5–3 mm long, filaments opposite anterior-lateral sepals 3–3.1 mm long, filaments opposite posterior-lateral petals 1.5–1.8 mm long, filaments opposite posterior-lateral sepals 2.5–2.6 mm long, filament opposite posterior petal 1.6–2 mm long; anthers 2.4–2.8 mm long. Ovary glabrous; styles ca. 3.6 mm long. Coccus ca. 5 mm high, ca. 4 mm in diameter, glabrous; areole 4–4.8 mm long, 3.3–4 mm wide; outer cotyledon 2.7–2.8 mm long, inner cotyledon 2.3–2.5 mm long. Chromosome number unknown.

**Phenology.** Collected in flower and fruit in August and September.

**Distribution** (Fig. 5). Mexico (Oaxaca); on sandy soils, in dunes and coastal deciduous forest; sea level to 70 m.

**ADDITIONAL SPECIMENS EXAMINED.** **Mexico.** OAXACA: Mpio. Huatulco, 5 km de la carr. nac. por la brecha a las playas de Cacaluta, 15°45'10"N, 96°10'10"W, *Castillo C. et al.* 9498 (XAL); Mpio. Huatulco, Playa de San Agustín, 15°40'30"N, 96°14'20"W, *Castillo C. et al.* 9642 (MEXU, XAL); Dto. Tehuantepec, Mpio. Santiago Astata, Las Peñas, 500 m al suroeste de la laguna que encuntra a 2 km al sur de Barra de la Cruz, 15°49'25.4"N, 95°57'58.5"W, *Elorsa C.* 5030 (MICH); Playa Coyote, *Liebmann* 8675 (C); San Agustín, *Liebmann* 8676, 8682 (C); Dto. Tehuantepec, Mpio. San Pedro Huamelula, Cerro Piedra del Aire, 200 m al sureste del Rancho El Paraíso, 15°52'7.8"N, 95°50'14.3"W, *Salas M.* 4122 (MICH).

*Galphimia arenicola* is found on dunes and in deciduous forest along the coast of Oaxaca. It is unique in the genus in that the margins of the laminae bear elongate, multicellular, epidermal processes. Like *G. tuberculata*, a lowland species found from Sinaloa to Guerrero, *G. arenicola* is marked by persistent tubercles on its shoots and leaves, but differs in its smaller flowers with an eglandular calyx and a glabrous ovary. *Galphimia oaxacana*, which is known only from the Isthmus of Tehuantepec, lacks tubercles; it has a pilose ovary and (usually) calyx glands.

- 7. *Galphimia glandulosa*** Cav., *Anales Hist. Nat.* 1: 37. Oct 1799, non *Galphimia glandulosa* Rose, 1897. *Malpighia glandulosa* (Cav.) Persoon, *Syn. pl.* 1: 506. 1805, non *Malpighia glandulosa* Cav., 1789. *Malpighia biglandulosa* Poir. in Lam., *Encycl., Suppl.* 4: 7. 1816. *Galphimia glandulosa* var. *lanceolata* DC., *Prodr.* 1: 582. 1824, nom. superfl. *Thryallis glandulosa* (Cav.) Kuntze, *Rev. gen. pl.* 1: 89. 1891.—**TYPE:** MEXICO, Guerrero: "Acapulco, Acambaro, &c.," *Née s.n.* (holotype: MA-29470, excluding the inflorescence mounted in middle of sheet and the branchlet at lower right, which are *G. paniculata* Bartl.; microfiche: MICH!, photos: F! MICH! MO!)
- Galphimia glandulosa* Rose, *Contr. U.S. Natl. Herb.* 5: 137. 1897, non *Galphimia glandulosa* Cav., 1799. *Thryallis palmeri* Rose, *Contr. U.S. Natl. Herb.* 12: 281. 1909. *Galphimia paniculata* var. *glandulosa* Nied. in Engler, *Pflanzenreich* IV, 141: 599. 1928.—**TYPE:** MEXICO, Guerrero: near Acapulco, *Palmer* 474 in 1895 (holotype: US!, photos: F! NY!; isotype: NY-fragment!).
- Thryallis dasycarpa* Small, *N. Amer. Fl.* 25: 151. 1910.—**TYPE:** MEXICO, Sinaloa: Rosario, Jan 1895, *Lamb* 470 (holotype: NY!; isotypes: DS! F, G! GH! NY-fragment! UC-fragment! US!).

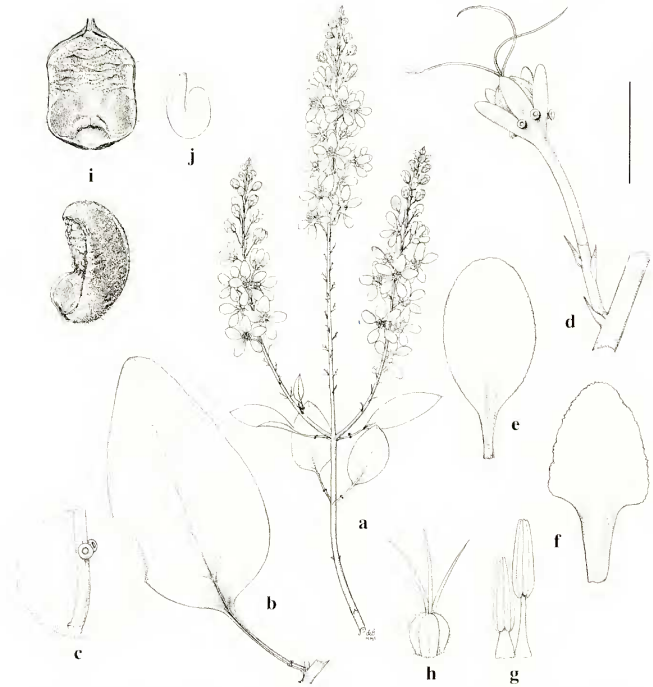


FIG. 7. *Galpurnia glandulosa*. a. Flowering branch. b. Large leaf. c. Base of petiole with glands. d. Old flower with maturing fruit, borne on pedicel and peduncle with portion of inflorescence axis; note calyx glands. e. Lateral petal. f. Posterior petal. g. Stamens, adaxial view, opposite posterior petal (left) and posterior-lateral sepal (right). h. Gynoecium. i. Cocci, adaxial view (above) and lateral view (below). j. Embryo. Scale bar: a, b, 4 cm; c, e, 8 mm; d-h, 5 mm; i, j, 4 mm. (Based on: a, d, *González Ortega 5141*, US; b, c, *Pérez 1562*, MEXU; e-h, *McVaugh 22903*, MICH; i, j, *Anderson & Anderson 5849*, MICH.)

Shrub or suffrutescent herb to 4 m; flowering shoots usually leafless or bearing only young leaves, sometimes with mature leaves present. Vestiture absent except for pilose ovary and fruit. Laminas of the larger leaves 4.5–14 cm long, 2–6 cm wide, lanceolate to elliptical to ovate to rhombic, apex apiculate, base cuneate, secondary veins prominulous abaxially; petioles 1–4 cm long; glands a pair usually borne on the petiole in the basal 1/6–1/2, opposite or up to 4 mm apart, rarely also at the base of the blade or absent, each gland 0.8–1.5 mm in diameter, disklike and prominent; stipules 1.2–1.8 mm long, 0.7–0.8 mm wide, linear or very narrowly triangular. Inflorescence a terminal raceme or a panicle, the axes lax and commonly whip-like; peduncles 2.5–6.5 (–10.5) mm long, pedicels 6.2–12.3 mm long, peduncles 0.3–0.7 (–1) times as long as pedicels; bracts 1.7–3.2 mm long, 0.4–0.7 mm wide, linear, bracteoles 1.2–1.7 (–2) mm

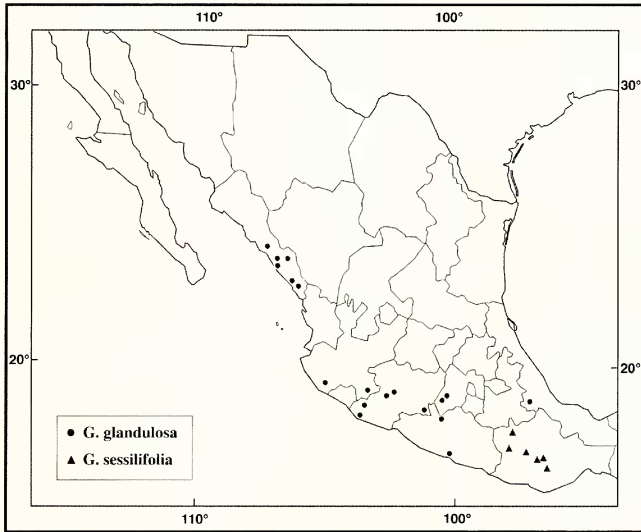


FIG. 8. Distribution of *Galphimia glandulosa* and *G. sessilifolia*.

long, 0.3–0.5 mm wide, linear; bracteoles opposite or subopposite, borne in the proximal 1/2 of the peduncle to near its base. Sepals (2–) 3–3.5 mm long, 1.2–1.7 mm wide, linear to oblong, margin entire or finely denticulate in the distal 1/2; glands usually 5 per calyx, sometimes fewer or none, 0.3–0.5 (–0.7) mm in diameter, prominent or peglike and up to 0.5 mm long, each borne at the base of the sinus between adjacent sepals. Petals deciduous, unequal, yellow but usually suffused with red, margin denticulate; lateral petals: claw 1.3–2 mm long, 0.5–0.6 mm wide, limb 6–7.5 mm long, 3.5–4.5 mm wide, elliptical, apex obtuse, base attenuate; posterior petal: claw 2.5–3.3 mm long, 1.5–2 mm wide, limb 5.5–7 mm long, 4–5 (–5.8) mm wide, ovate-triangular, apex broadly rounded, base gradually attenuate. Stamens of unequal length; filament opposite anterior sepal 3–3.2 mm long, filaments opposite anterior-lateral petals 2–2.5 mm long, filaments opposite anterior-lateral sepals 2.7–3 mm long, filaments opposite posterior-lateral petals 1.5–1.6 mm long, filaments opposite posterior-lateral sepals 2.8–3.5 mm long, filament opposite posterior petal 1.5–1.9 mm long; anthers 3.3–4.4 mm long. Ovary pilose throughout or sometimes the distal 1/3 glabrous, hairs to 0.1 mm long; styles (3.7–) 4–5.5 mm long. Cocculus 4.5–5 mm high, 3.2–3.5 mm in diameter, pilose throughout or sometimes the distal 1/3 glabrous; areole 4.5–5 mm long, ca. 3 mm wide; outer cotyledon ca. 3 mm long, inner cotyledon ca. 2.2 mm long. Chromosome number unknown.

Phenology. Collected in flower and fruit from December to May, one collection in flower in October (*González M. 4010*).

Distribution (Fig. 8). Mexico (Guerrero, Jalisco, México, Michoacán, Sinaloa; one collection from Veracruz); in oak forest and deciduous forest; 20–1150 (–2450) m.

REPRESENTATIVE SPECIMENS. **Mexico.** GUERRERO: Temisco, *Bruff 1308* (MEXU); trail E of Temisco, N of Río Balsas, Df. Oaxaca, *Mexia 8948a* (U.C.); arriba Icaeos Acapulco, *Miranda 4346* (MEXU); Aehotla, *Reko 4919* (US).—JALISCO: Mpio. La Huerta, Arroyo Chamela, 0.3 km E of Hwy 200 (Barra de Navidad–Puerto Vallarta), Km 63.5, environs of Est. Biol. Chamela (UNAM), *Bullock 1114* (MICH); steep hills 3–15 km by rd S of Jilotlán, *McVaugh 22903* (ENCB, MICH); Mpio. La Huerta, Est. Biol. Chamela, *Pérez J. 1562* (MEXU); Mpio. La Huerta, Chamela, rd along Río Chamela near grounds of the “Instituto de Biología” of UNAM, 19°32'N, 105°05'W, *van Rooden 726* (MEXU, MICH).—MEXICO: El Palmar Chico, Tejupileo, *González M. 4010* (MEXU); pic de la loma, Tejupileo, *González M. et al. 5538* (MEXU, XAL); Platanal, Temascaltepec, *Hinton et al. 5749* (A. F. G. NY); Mpio. Temascaltepec, Nanchititla, *Hinton et al. 7354* (BM, ENCB, F. GH, LL, MEXU, NY, S. US).—MICHOACÁN: 20 km by rd S of Uruapan on rd to Cuatro Caminos, *Anderson & Anderson 5849* (MICH); rd to Apatzingán, ca. 2 km N Aguillilla, *Burch 2016* (MO); Mpio. Pómaro, al N de Maruata, camino a Pómaro, *Guevara F. 1620* (CHAPA, ENCB, IBUG); Mpio. Tiquicheo, entre Huetamo y Tiquicheo, *Medrano 4124* (MEXU).—SINALOA: Mpio. San Ignacio, Balboa, San Javier, *González Ortega 5138* (MEXU, US); Balboa, *González Ortega 5141* (US); Mpio. Mazatlán, Guaracha, El Quelite(?), *González Ortega 5419* (ENCB, MEXU, US); Mpio. Mazatlán, Mazatlán, *González Ortega 5631* (ENCB, K, MEXU, US); vic. of Culiacán, *González Ortega 6693* (US); 31 mi N of Mazatlán on coast hwy, *Kinnoch 1918* (CAS, MEXU); vicinity of Rosario, *Rose 14567* (A. C. F. GH, MO, NY, P. S. US); vicinity of Guadalupe, *Rose 14776* (GH, NY, US).—VERACRUZ: Córdoba, *Reko 5133* (US).

*Galphimia glandulosa* is readily separated from all other species of by its lack of vestiture (except for the pilose ovary and fruit), its petioles with a pair of glands in the proximal 1/6–1/2, and the whip-like inflorescences. The flowers have a (commonly) glandular calyx and petals mostly entirely suffused with red. This species flowers before or while the leaves develop and thus is rarely collected with mature leaves. The partly sympatric *G. floribunda* is also commonly glabrous in all its parts, but it has an eglandular calyx, persistent yellow petals, and a glabrous ovary and fruit, and bears the leaf glands at the base of the lamina. The range of *G. glandulosa* extends from central Sinaloa to southern México and Guerrero: the record from Veracruz is surprising and the locality perhaps of doubtful accuracy.

Several students of *Galphimia* were uncertain about the application of the name *G. glandulosa* Cav., and thus this species has been known under several synonyms. Rose described it in 1897 as a novelty with the same epithet. Later (1909) he accepted Kuntze's (1891) transfer of all species of *Galphimia* to *Thryallis* L., and provided the nomen novum *Thryallis palmeri* for *G. glandulosa* Rose, because the combination *Thryallis glandulosa* (Cav.) Kuntze had already been published; Rose listed *Thryallis glandulosa* (Cav.) Kuntze among the “uncertain species.” Small (1910) accepted *T. palmeri*, from which he excluded *G. glandulosa* Cav. (but did not accommodate the Cavanilles name elsewhere in his treatment), and also published *Thryallis dasycarpa*, which he differentiated by its eglandular calyx and smaller leaves. The type collection of *Thryallis dasycarpa* consists of flowering branchlets and only the smaller leaves associated with the inflorescences; the calyces of the holotype are indeed eglandular but a few in the isotypes do have a gland or two.

**8. *Galphimia langlassei*** (S. F. Blake) C. Anderson, Syst. Bot. 28: 715. 2003. *Thryallis langlassei* S. F. Blake, Contr. Gray Herb. 52: 71. 1917.—TYPE: MEXICO, Guerrero (fide McVaugh, 1951); San Andrés, 700 m, 22 Mar 1899, *Langlassé 955* (holotype: GH!; isotypes: F, G! K! P! US!; photo of P isotype: MICH!).

Fig. 9.

Shrub or subshrub to 3 m; stems sparsely tomentulose when young, soon glabrous. Vestiture of all vegetative parts composed of sessile, straight or wavy to crisped, reddish brown hairs 0.2–0.8 mm long. Laminas of the larger leaves 5–14 cm long, 1.5–4.8 cm wide, elliptical or narrowly so to lanceolate, apex acute or apiculate, base

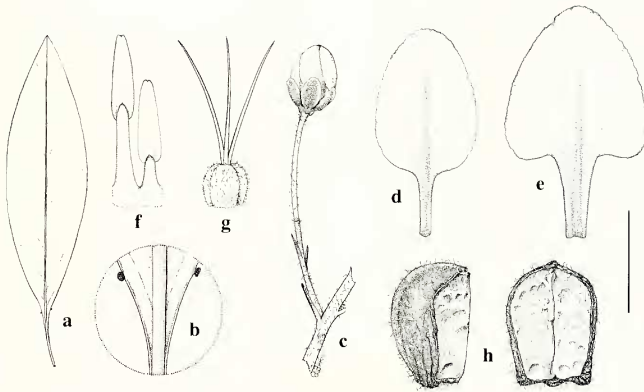


FIG. 9. *Galphimia langlassei*. a. Leaf. b. Base of lamina, showing pair of marginal glands. c. Flower bud borne on pedicel and peduncle, with portion of inflorescence axis. d. Lateral petal. e. Posterior petal. f. Stamens, abaxial view, opposite posterior petal (right) and posterior-lateral sepal (left). g. Gynoecium. h. Cocci, lateral view (left) and adaxial view (right). Scale bar: a, 4 cm; b, f-h, 4 mm; c, 1 cm; d, e, 5 mm. (Based on: a, b, *Cuevas & Rosales 1828*, IEB; c, *Daniel & Bartholomew 4849*, MICH; d, e, *Cochrane et al. 11687*, WIS; f, g, *Santana M. et al. 4807*, WIS; h, *Pepita 86*, ZEA.)

attenuate and somewhat decurrent, glabrous or sometimes with a few scattered hairs abaxially on the midrib, costa and secondary veins prominent abaxially, margin entire; petioles 1–2.5 cm long, glabrous or with a few scattered hairs; glands usually a pair (rarely only 1 gland) borne on the margin of the lamina 0.1–1 cm above the base, each gland 0.5–1.1 mm in diameter, disklike and prominent, or peglike and up to 1.2 mm long; stipules 1.2–2.8 (–3.5) mm long, 0.4–1 mm wide, linear or narrowly triangular, margin distally ciliate. Inflorescence a terminal raceme or panicle, the axes tomentulose or sparsely so; peduncles 4.5–12.5 mm long, pedicels 4.5–13 mm long, both tomentulose, peduncles 0.6–1.2 (–1.6) times as long as pedicels; bracts 1.3–2.2 (–3.4) mm long, 0.5–0.8 mm wide, linear, bracteoles 1–2 (–2.5) mm long, 0.3–0.5 (–0.7) mm wide, linear, bracts and bracteoles glabrous or with a few scattered hairs along the margin; bracteoles subopposite or up to 2 mm apart, borne in the distal 1/4–1/2 of the peduncle. Sepals 2.7–3.5 mm long, 1.2–2 mm wide, oblong to elliptical, glabrous, margin distally denticulate-ciliate; glands usually absent [in *Hinton et al. 11683* some calyces with 1–3 glands, each gland 0.3–0.5 mm in diameter, prominent]. Petals deciduous, unequal, yellow, often suffused with red, especially along the claw and midrib of the limb, glabrous; lateral petals: claw 2.3–2.8 (–3) mm long, 0.5–0.6 mm wide, limb 6–7 mm long, 4.5–5.5 mm wide, ovate, apex rounded, base truncate or subacute; posterior petal: claw 3.5–4 mm long, 1.3–1.5 mm wide, limb 6.5–7.7 (–8) mm long, 6–7.7 mm wide, broadly triangular, apex broadly rounded, base truncate to cordate. Stamens of unequal length; filament opposite anterior sepal 3.5–4.5 mm long, filaments opposite anterior-lateral petals 2.8–3.5 (–3.7) mm long, filaments opposite anterior-lateral sepals 3–4 (–4.5) mm long, filaments opposite posterior-lateral petals 1.6–2.5 (–2.8) mm long, filaments opposite posterior-lateral sepals 3.5–4.6 mm long,

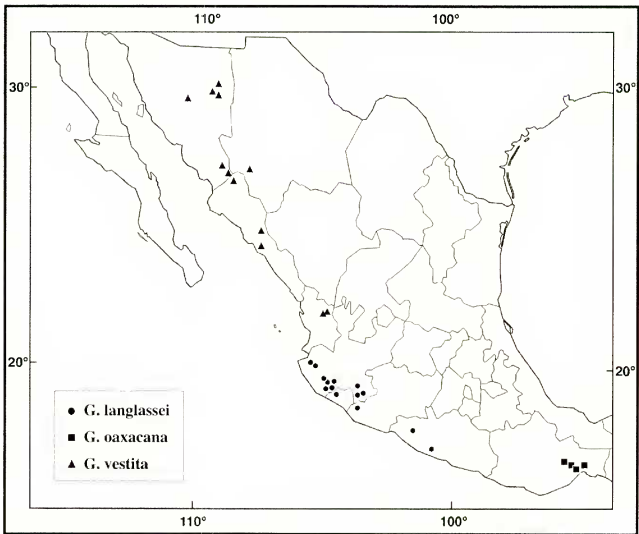


FIG. 10. Distribution of *Galphimia langlassei*, *G. oxacana*, and *G. vestita*.

filament opposite posterior petal 1.6–2.6 mm long; anthers (2.8–) 3–3.6 (–4) mm long. Ovary pilose, hairs to 0.3 mm long; styles 5–6.5 (–6.8) mm long. Coccus 4–4.5 mm high, 3–3.8 mm in diameter, pilose to glabrescent when mature; areole 3.5–4.2 mm long, 2.5–3.8 mm wide; mature embryo not seen. Chromosome number unknown.

Phenology. Collected in flower from November through June, in fruit from February through June.

Distribution (Fig. 10). Mexico (Colima, Guerrero, Jalisco, Michoacán); oak forests and pine-oak forests; 100–1710 m.

REPRESENTATIVE SPECIMENS. **Mexico.** COLIMA: 9–10 km E or SE by winding rd from Minatitlán, *McVaugh 26226* (MICH).—GUERRERO: Mpio. Montes de Oca, San Antonio, *Hinton et al. 11683* (GH, US).—JALISCO: Mpio. Casimiro Castillo, 3–4 km SE of Casimiro Castillo; Arroyo Tacubaya, at base of Cerro La Petaca, ca. 20 km SSW of Autlán, 19°34'50"–54"N, 104°24'29"–45"W, *Cochrane et al. 11687* (WIS); Mpio. Casimiro Castillo, 1–2 km al E de Casimiro Castillo, *Cuevas & Rosales 1828* (IEB, WIS, ZEA); rd to Microondas Los Mazos near summit of pass (Puerto Los Mazos) between Autlán and La Huerta, *Daniel & Bartholomew 4849* (CAS, MICH); Mpio. Tecalitlán, carr. Cd. Guzmán–Pihuamo, Km 46, terracería Llanitos–Mexiquillo a 16 km, *Fuentes O. 47* (CHAPA, ENCB, IBUG, MICH); Mpio. Autlán, 12–13 km al SSE de Autlán, 500–1000 m al SSE de Ahuacapán, 19°39'50"N, 104°19'07"W, *Guzmán & Cuevas 879* (IBUG, MEXU, WIS, ZEA); Mpio. Talpa de Allende, brecha de Talpa a La Cuesta, *Machuca N. et al. 7063* (MICH); along hwy SW of Autlán toward Manzanillo, on upper slopes of barranca above the pass, *McVaugh 10234* (MEXU, MICH); precipitous mountainsides 10–12 km above (N of) La Cuesta, below pass to Talpa de Allende, *McVaugh 23357* (ENCB, MICH); 3 km S por brecha a Las Joyas–Ahuacapán, *Pepita 86* (ZEA); Mpio. Tecalitlán, Km 6, brecha a Jilotlán de Dolores, *Pérez de la Rosa 7* (IBUG, MICH); Mpio. Cuautitlán, entre Ayotitlán y Chanco, 19°28'N, 104°10'W, *Robles et al. 712* (IEB, WIS, ZEA); Mpio. Cuautitlán, 4–5 km al NW de Minatitlán, 2–3 km al NNE de Peña Colorada, Las Pesadas, 19°24'N, 104°04'W, *Santana M. et al. 4807* (WIS, ZEA).—MICHOCÁN: Aquila, Dtto. Coalcomán, *Hinton et al. 15867* (NY, US).

*Galphimia langlassei* is a common shrub or subshrub of the pine-oak forests of lowland western Mexico. It has elongate leaves bearing glands on the margin of the lamina, and the ovary and fruit is abundantly pilose; only one collection examined, *Hinton et al.* 11683, had calyx glands on a few flowers. The other species in its range with pilose ovaries and fruits are *G. glandulosa*, *G. mexiae*, and *G. radialis*. *Galphimia glandulosa* is readily distinguished by its elongate, whip-like inflorescences bearing flowers with nearly all-red petals and a glandular calyx. In addition, the leaf glands are borne in the basal 1/6–1/2 of the petiole. *Galphimia radialis* differs from *G. langlassei* in that its petals are subequal and the hairs on the ovary and fruit are to 0.8 mm long; it is known only from central Guerrero. See the discussion of *G. mexiae* (no. 9) for a comparison with *G. langlassei*.

**9. *Galphimia mexiae*** C. Anderson, Syst. Bot. 28: 717. 2003.—TYPE: MEXICO. Jalisco: San Sebastián [del Oeste] to Hacienda de Ototal, 1425 m, 2 Mar 1927, *Mexia* 1778 (holotype: CAS!; isotypes: A! GH! MO! US!). Fig. 11.

Herb or subshrub to 3 m; stems sparsely tomentulose when young, soon glabrous. Vesture of all vegetative parts of sessile, wavy to crisped, reddish brown hairs 0.2–0.5 mm long. Laminas of the larger leaves 4–8.5 (–12) cm long, 1.8–4 cm wide, lanceolate to elliptical to narrowly rhombic, apex acute or apiculate, base cuneate and somewhat decurrent, glabrous, secondary veins prominent or prominulous abaxially; petioles 1–2 (–3.5) cm long, glabrous; glands a pair borne on the margin of the lamina commonly ca. 1 cm above the base, each gland 0.4–0.8 mm in diameter, disklike and prominent, or rarely peglike and up to 0.5 mm long; stipules 2–3 mm long, 0.5–1.8 mm wide, linear to narrowly triangular, glabrous and distally ciliate. Inflorescence a terminal raceme or small panicle, the axes tomentulose; peduncles 3.5–7 mm long, pedicels 8.5–12 mm long, both sparsely tomentulose to glabrate, peduncles 0.3–0.5 (–0.7) times as long as pedicels; bracts 2–4 mm long, 0.6–1.2 mm wide, linear, bracteoles 1.2–2 mm long [2.5–3.7 mm long in *Nelson 4060*], 0.4–0.6 mm wide, linear, bracts and bracteoles glabrous or with scattered hairs along the margin distally; bracteoles subopposite or up to 2 mm apart, borne in the distal 1/4–1/2 of the peduncle or sometimes just below the apex. Sepals 2.5–3 mm long, 1.4–2.3 mm wide, oblong to narrowly elliptical, glabrous, margin entire to distally denticulate (–ciliate); glands absent. Petals deciduous, unequal, yellow and suffused with red along the claw and midrib of the limb, glabrous, margin finely denticulate; lateral petals: claw 2–2.8 mm long, 0.5–0.6 mm wide, limb 4.5–6 mm long, 3.7–4.7 mm wide, ovate-triangular, apex subacute to obtuse, base truncate or slightly attenuate; posterior petal: claw 3.3–4 mm long, 1.4–1.8 mm wide, limb 5–6.5 mm long, 5–6.5 mm wide, broadly triangular or ovate-triangular, apex broadly rounded, base truncate or acute. Stamens of unequal length; filament opposite anterior sepal (2.2–) 2.6–3 mm long, filaments opposite anterior-lateral petals (2.2–) 2.4–3 mm long, filaments opposite anterior-lateral sepals 2–2.8 mm long, filaments opposite posterior-lateral petals 1.8–2.3 (–3) mm long, filaments opposite posterior-lateral sepals 1.5–1.8 (–2.2) mm long, filament opposite posterior petal 1.5–1.7 (–2) mm long; anthers 2.3–2.5 (–2.8) mm long. Ovary pilose, hairs to 0.3 mm long; styles 4–5 mm long. Coccus 4.5–5.5 mm high, 3.5–4 mm in diameter, pilose to glabrescent in age; areole 4–4.5 mm long, 3–3.5 mm wide; outer cotyledon 2.5–2.8 mm long, inner cotyledon 1.8–2.1 mm long. Chromosome number unknown.

Phenology. Collected in flower and fruit from February through May.

Distribution (Fig. 25). Mexico (northwestern Jalisco and adjacent Nayarit); pine-oak forest; 630–1880 m.

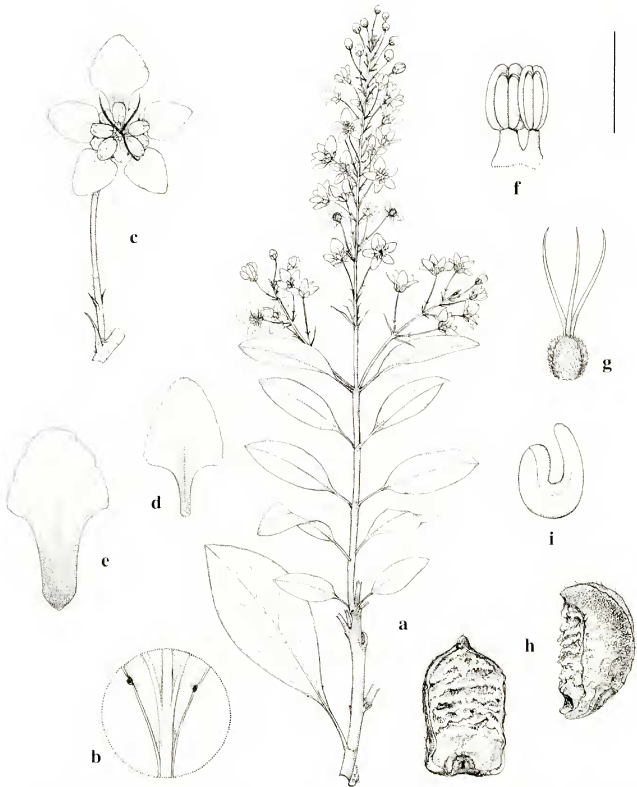


FIG. 11. *Galphimia mexiae*. a. Flowering branch. b. Base of lamina, showing marginal glands. c. Flower with posterior petal uppermost, borne on pedicel and peduncle, with portion of inflorescence axis. d. Lateral petal. e. Posterior petal. f. Stamens, adaxial view, opposite posterior petal (left) and posterior-lateral sepal (right). g. Gynoecium. h. Cocci, lateral view (right) and adaxial view (left). i. Embryo. Scale bar: a, 4 cm; b, 8 mm; c, 1 cm; d, e, 5 mm; f-h, 4 mm; i, 2.7 mm. (Based on: a-c, *Anderson & Anderson 6122*, MICH; d-g, *Nelson 4060*, US; h, i, *Almeda 2543*, MICH.)

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** JALISCO: 27.8 mi SSE of Puerto Vallarta, *Almeda 2543* (CAS, MICH); low hills ca. 35 km (stri line) E of Cabo Corrientes, on rd from Puerto Vallarta to El Tuito, *Anderson & Anderson 6122* (MICH); Mpio. Talpa, entre Cumbre del Tejamanil y Cuale, *González T. 102* (MICH); Mpio. Cabo Corrientes, steep mountainsides 3-10 km generally E on rd to Mina del Cuale, from junction 5 km NW of El Tuito, *McVaugh 26411A* (MICH); trail San Sebastián to Las Mesitas, *Mexia 1863-a* (F. US); rd between Mascota and San Sebastián, *Nelson 4060* (GH, US).—NAYARIT: 17.7 km al W de Tepic, 7 km al W de Carranza, *Cowan 4773* (MICH, TEX); Mpio. Tepic, 7 km al S de la entrada al camino del Cuarenteño, 21°28'N, 105°00'W, *Flores F. 2531* (MEXU).



*Galphimia mexiae* is known only from a small region in northwestern Jalisco and adjacent Nayarit. It is distinctive in its androecium, composed of very short filaments and anthers. All petals have a broadly triangular limb; that of the posterior petal narrows only slightly to an exceptionally broad claw. These traits readily separate it from the sympatric *G. langlassei*, which also has usually narrow laminae with glands on the margin near the base and a pilose ovary and fruit. Collections of *G. mexiae* have been misdetermined as *G. glandulosa* (as "*Thryallis dasycarpa*") and *G. tuberculata*, which also share a pilose ovary and fruit, but not the characters of the androecium and corolla. *Galphimia glandulosa* is entirely glabrous, bears the leaf glands in the proximal 1/6–1/2 of the petiole, and has whip-like inflorescences; the flowers have nearly all-red petals and a glandular calyx. *Galphimia tuberculata* is named for the persistent tubercles found on the axes, petioles, and laminar margins; *G. mexiae* lacks such tubercles.

**10. *Galphimia radialis*** C. Anderson, Syst. Bot. 28: 719. 2003.—TYPE: MEXICO. Guerrero: Mpio. Chichihualco, 29 km al W de Filo de Caballo, carr. a Pto. del Gallo, 2100 m, 18 Aug 1982, Tenorio L. 1471 (holotype: MICH!). Fig. 12

Shrub to 3 m; stems tomentulose when young, soon glabrous. Vesture of all vegetative parts of subsessile, wavy to crisped, reddish brown hairs 0.2–0.7 mm long. Laminae of the larger leaves 7–12 cm long, 2–5 cm wide, lanceolate to elliptical, apex apiculate, base cuneate-decurrent, glabrous, secondary veins prominulous, margin entire; petioles 1.5–2.3 cm long, glabrous; glands a pair borne on the margin of the lamina commonly 2–2.5 cm above the base, each gland 0.4–0.5 mm in diameter, flush with the margin; stipules 3.5–6 mm long, 1.2–1.5 mm wide, linear, glabrous or distally ciliate. Inflorescence a terminal raceme, the axes tomentulose; peduncles 4–9.5 mm long, pedicels 7–13.5 mm long, both tomentulose, peduncles 0.5–0.8 times as long as pedicels; bracts 3–6 mm long, 0.5–0.7 mm wide, linear, abaxially with scattered hairs especially along the margin, bracteoles 1.6–3 mm long, 0.4–0.6 mm wide, linear, glabrous; bracteoles subopposite or up to 2.2 mm apart, the proximal bracteole inserted below to ca. the middle of the peduncle, the distal one at about the middle to the distal 1/4 of the peduncle. Sepals 3.5–4.5 mm long, 1.6–2 mm wide, linear to oblong, glabrous or with a few scattered hairs abaxially, margin denticulate-ciliate or only in the distal 1/4; glands absent. Petals deciduous, subequal, the posterior petal slightly larger than the lateral ones, glabrous, yellow and suffused with red along the claw and midrib of the limb, margin denticulate-fimbriate; claw 1.8–2.8 mm long, 0.6–0.7 mm wide, limb 6.2–7.7 mm long, 5.5–6.5 mm wide, broadly ovate, apex broadly rounded, base subtruncate. Stamens of unequal length; filament opposite anterior sepal 4.5–4.8 mm long, filaments opposite anterior-lateral petals 4.2–4.5 mm long, filaments opposite anterior-lateral sepals 4.4–4.5 mm long, filaments opposite posterior-lateral petals 3.2–4 mm long, filaments opposite posterior-lateral sepals 4–4.3 mm long, filament opposite posterior petal 3–3.5 mm long; anthers 2.2–2.5 mm long. Ovary pilose along the sutures and in the basal 1/3–1/2, hairs to 0.8 mm long; styles 4.6–5.2 mm long. Cocculus 4.7–5 mm long, 3.8–4 mm in diameter, pilose along the sutures and in the basal 1/3–1/2; areole ca. 4 mm long, 2.5–3 mm wide, mature seed not seen. Chromosome number unknown.

Phenology. Collected in flower in January, May, August, and November, in fruit in March and August.

Distribution (Fig. 25). Mexico (Guerrero); pine-oak forest; 1700–2100 m.

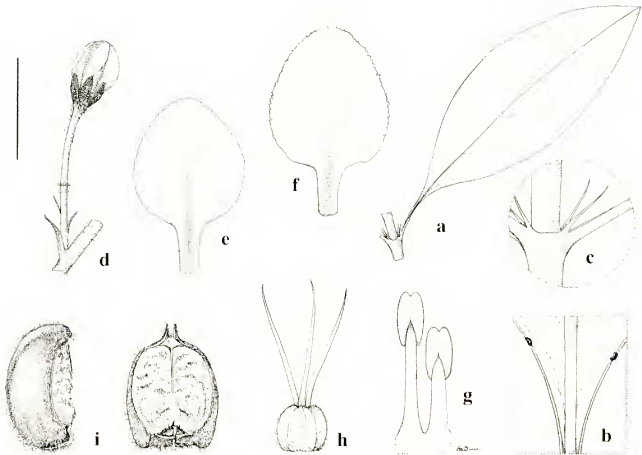


FIG. 12. *Galphimia radialis*. a. Leaf. b. Base of lamina, showing marginal glands. c. Node, showing long stipules. d. Flower bud, borne on pedicel and peduncle, with portion of inflorescence axis. e. Lateral petal. f. Posterior petal. g. Stamens, abaxial view, opposite posterior petal (right) and posterior-lateral sepal (left). h. Gynoecium. i. Cocci, lateral view (left) and adaxial view (right). Scale bar: a, 4 cm; b, c, 1 cm; d, 1.3 cm; e, f, 5 mm; g-i, 4 mm. (Based on: a, Estrada R. 119, IEB; b-d, Fonseca 1001, MEXU; c-h, Tenorio L. 1471, MICH; i, Paray 2014, ENCB.)

ADDITIONAL SPECIMENS EXAMINED, **Mexico**. GUERRERO: Mpio. Atoyac de Alvarez, trayecto entre Los Arrayanes y El Descanso, Estrada R. 119 (IEB); Mpio. Chichihualco, cerca de Hierba Buena, Fonseca 1001 (MEXU); Mpio. Tlacoatepec, faldas del Cerro Tlacoatepec, Paray 2014 (ENCB); Cerro Teotepec y alrededores, Paray 4065 (MEXU); Mpio. Malinaltepec, Malinaltepec, 17°14'N, 98°40'W, Wagenbreth 807 (MO).

*Galphimia radialis* is the only species among those with well-developed peduncles in which the petals are subequal. It also has larger stipules (3.5–6 mm long) than most species (usually 1–3 mm long), and unusually long hairs on the ovary (to 0.8 mm long vs. 0.1–0.3 mm long). It may be confused with *G. langlassei*, which has similar leaves, but unequal petals and longer anthers (3–4 mm).

**11. *Galphimia sessilifolia*** Rose, Contr. U.S. Natl. Herb. 3: 313. 1895. *Thryallis sessilifolia* (Rose) Rose, Contr. U.S. Natl. Herb. 12: 281. 1909.—TYPE: MEXICO. Oaxaca: Las Sedas, 6000 ft, 1 Aug 1984, Pringle 4901 (holotype: US!; isotypes: A! BM! BR! CM, F, G! GH! GOET! K! MEXU! MO! NY! P! S! UC! US! W!; photo of P isotype: MICH!).

Fig. 13.

Shrub to ca. 1 m; stems sparsely strigose when young, soon glabrous. Vesture of all vegetative parts of subsessile to sessile, straight to wavy, reddish brown hairs 0.2–0.7 mm long. Laminas of the larger leaves 1.5–4 cm long, 1–2.5 cm wide, ovate or narrowly so, apex apiculate, base truncate or shallowly cordate, glabrous, coriaceous,

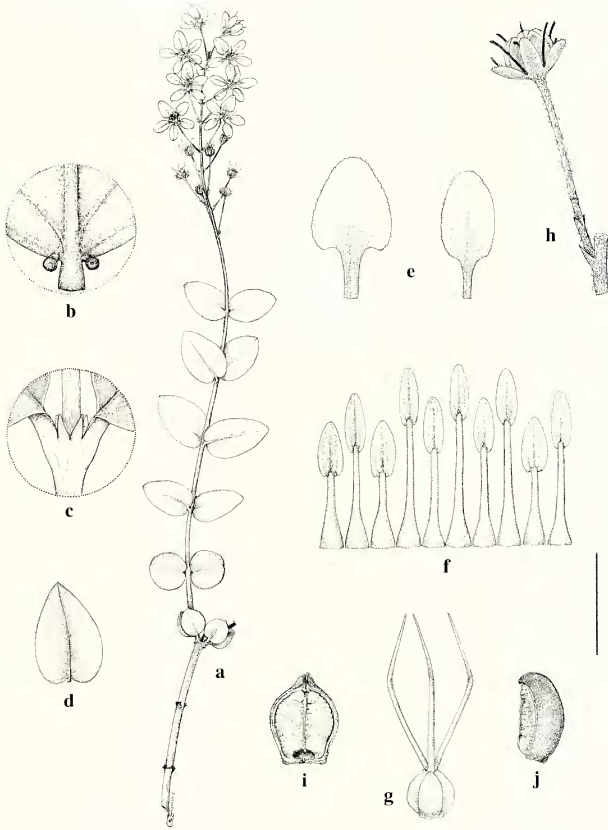


FIG. 13. *Galphimia sessilifolia*. a. Flowering branch. b. Base of leaf with glands, abaxial view. c. Node with stipules. d. Detached large leaf. e. Posterior petal (left) and lateral petal (right). f. Androecium laid out, abaxial view, the stamen at left opposite posterior petal. g. Gynoecium. h. Fruit borne on pedicel and peduncle, with portion of inflorescence axis. i. Cocculus, adaxial view. j. Cocculus, lateral view. Scale bar: a, d, 4 cm; b, c, f, g, i, j, 4 mm; e, h, 8 mm. (Based on: a, b, f, g, *Lorence 4626*, MEXU; c, *Torres C. 7151*, MICH; d, *Pringle 4901*, MEXU; e, *Pringle 7458*, MEXU; h, *Lorence 4626*, MO; i, j, *Salinas T. 6607*, MICH.)

secondary veins prominulous abaxially; margin entire; leaves sessile, petioles to 1 mm long, glabrous; glands absent, or present only on the first pair of leaves at the base of a shoot, these laminas the smallest and suborbicular and with 1 or 2 glands borne on the margin at or near the base, glands 0.3–0.4 mm in diameter, disklike and sessile, or peglike and up to 0.7 mm long; stipules 1–2 mm long, ca. 0.5 mm wide, linear, glabrous. Inflorescence a solitary terminal raceme, the axes glabrate; peduncles 1–5 mm long, pedicels 7.5–12 mm long, both sparsely tomentulose, peduncles 0.2–0.6 (–0.9) times as long as pedicels; bracts 1.5–2.5 mm long, 0.7–0.8 mm wide, linear, bracteoles 1–2 mm long, ca. 0.5 mm wide, linear, bracts and bracteoles glabrous; bracteoles borne variously on the peduncle from near the base to just below the apex, subopposite or up to 0.5 mm apart. Sepals 2.5–3 mm long, 1.2–1.5 mm wide, oblong, glabrous, margin denticulate-ciliate in the distal 1/4–1/3; glands absent. Petals deciduous, unequal, yellow and tinged with red at the apex and often with a red stripe abaxially along the median vein, glabrous, margin denticulate; lateral petals: claw 2–2.5 mm long, ca. 0.5 mm wide, limb 6.5–7 mm long, 3.5–4.5 mm wide, oblong or narrowly ovate, apex obtuse, base attenuate to subtruncate; posterior petal: claw 3–4 mm long, 1.2–1.4 mm wide, limb 6.5–7 mm long, 5–6 mm wide, triangular, apex broadly rounded, base cordate. Stamens of unequal length: filament opposite anterior sepal 5–5.3 mm long, filaments opposite anterior-lateral petals 4–4.5 mm long, filaments opposite anterior-lateral sepals 4.5–5 mm long, filaments opposite posterior-lateral petals 3–3.2 mm long, filaments opposite posterior-lateral sepals ca. 4.5 mm long, filament opposite posterior petal ca. 3 mm long; anthers 2.5–4 mm long. Ovary glabrous; styles 5.5–7 mm long. Coccus ca. 3.5 mm long, ca. 2.5 mm in diameter, smooth, glabrous; areole ca. 2.7 mm long, ca. 2.3 mm wide; mature seed not seen. Chromosome number unknown.

**Phenology.** Collected in flower in July and August, in fruit in July, August, and December.

**Distribution** (Fig. 8). Mexico (Oaxaca); in arid scrub, matorral, dry sites in pine-oak and deciduous forest; 1980–2400 m.

**ADDITIONAL SPECIMENS EXAMINED.** **Mexico.** OAXACA: near Penan, *Conzatti s.n.* (US); along hwy between Oaxaca and Tehuacán, 26.2 mi NNW jet. Hwy 190, *Daniel & Baker 3758* (MICH); Mpio. Huitzo, Dto. Etla, ca. 0.5 km al E de Las Sedas, *Lorence 4626* (F, MEXU, MICH, MO, UAMIZ); 15 km by rd SE of Miahuatlán on rd to Puerto Angel in high mtns of Sierra Madre del Sur, 16°12'N, 96°30'W, *Marcks & Marcks 1003* (LL, MICH, TEX, WIS); Las Sedas, *Pringle 7458* (F, MEXU); Mpio. San Jerónimo Sosola, El Parián, Dto. Etla, 17°23'N, 97°00'W, *Salinas T. 6607* (CAS, MICH); Dto. Tlaxiaco, 3.7 km al NE del Ojite, cerca de Tlaxiaco, *Torres C. 7151* (F, MEXU, MICH, UAMIZ).

*Galphimia sessilifolia*, known from a few collections from Oaxaca, is readily recognized by its sessile, ovate, coriaceous leaves; leaf glands develop only on the first pair of leaves of a shoot, which has notably smaller and orbicular laminas. *Galphimia multicaulis*, which occurs in Oaxaca, is the only other species in the genus in which the petioles are rudimentary or very short. Unlike *G. sessilifolia*, it has persistent petals and glands present on the margin of all laminas.

- 12. *Galphimia mirandae*** C. Anderson, Contr. Univ. Michigan Herb. 24: 13. 2005.—  
TYPE: MEXICO. Puebla: Mpio. Tehuizingo, 12 km al NW of El Pitayo, carr. a Izúcar de Matamoros Puebla, 1350 m, 28 Jul 1983, *Torres C. 3296* (holotype: MEXU; isotype: MBM! MO!). Fig. 14.

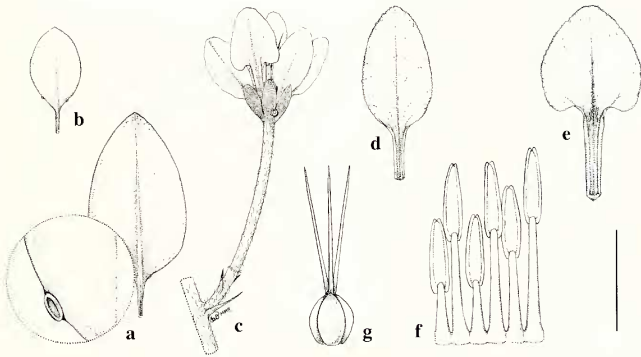


FIG. 14. *Galphimia mirandae*. a. Leaf with ovate lamina (detail of base of lamina showing marginal gland). b. Leaf with elliptical lamina. c. Flower borne on pedicel and peduncle, with portion of inflorescence axis; note calyx gland. d. Lateral petal. e. Posterior petal. f. Six stamens laid out, abaxial view, stamen at left opposite posterior petal. g. Gynoecium. Scale bar: a, 4 cm (4 mm); b, 4 cm; c, 1 cm; d, e, 5.7 mm; f, g, 4 mm. (Based on: a, *Miranda 2147*, MEXU; b–g, *Torres C. 3296*, MEXU.)

Shrub or treelet to 4 m; stems tomentulose, soon glabrescent to glabrous. Vestiture of all vegetative parts of sessile, wavy to crisped, reddish brown hairs 0.4–1 mm long. Laminas of the larger leaves 3–6.5 cm long, 2–4 cm wide, elliptical to broadly so, obovate, rhombic, ovate, or suborbicular, apex obtuse to acute, base acute to decurrent (especially in larger leaves), glabrous, secondary veins prominulous or not evident; margin entire; petioles 0.5–1 cm long, glabrous; glands commonly a pair on the margin of the lamina well above or at the base, if base decurrent then superficially appearing placed on the petiole, sometimes 1 or more additional glands borne on the margin of the lamina, each gland 0.5–1 mm in diameter, disklike and with a thick rim; stipules 2–4 mm long, 0.7–1.2 mm wide, narrowly triangular, glabrous. [Sometimes with only the terminal branches bearing a flush of small leaves along short internodes, the laminas 1.5–2.5 cm long, 1–1.5 cm wide.] Inflorescence a terminal raceme, the axes, peduncles, and pedicels tomentulose but glabrescent in older parts; peduncles 3–6 mm long, pedicels 14.5–18.5 mm long, peduncles 0.2–0.3 times as long as pedicels; bracts 2.5–3.2 mm long, 0.5–0.8 mm wide, linear, bracteoles 1.5–2 mm long, 0.3–0.5 mm wide, linear, bracts and bracteoles glabrous or with a few scattered hairs abaxially; bracteoles borne at about the middle of the peduncle, subopposite or up to 0.3 mm apart. Sepals 3.5–4.2 mm long, 1–1.5 mm wide, narrowly ovate to oblong, glabrous, margin entire or finely denticulate at the apex; glands absent, or rarely with one gland 0.5 mm in diameter. Petals deciduous, unequal, yellow, glabrous, margin finely denticulate; lateral petals: claw 2.5–2.8 mm long, 0.5 mm wide, limb 7–8.5 mm long, 4.5–5.5 mm wide, elliptical or narrowly lanceolate, apex subacute, base gradually attenuate; posterior petal: claw 4–4.2 mm long, 1–1.2 mm wide, limb 6.2–7.5 mm long, 6–7 mm wide, triangular or sometimes suborbicular, apex obtuse, base slightly cordate or slightly so. Stamens of unequal length; filament opposite anterior sepal

4–4.5 mm long, filaments opposite anterior-lateral petals 3–3.2 mm long, filaments opposite anterior-lateral sepals 3.7–4 mm long, filaments opposite posterior-lateral petals 2–2.2 mm long, filaments opposite posterior-lateral sepals 3.6–4 mm long, filament opposite posterior petal 2–2.3 mm long; anthers 3.3–3.7 mm long. Ovary glabrous or with scattered hairs on the sutures, hairs to 0.1 mm long; styles 5–6.6 mm long. Mature coccus not seen. Chromosome number unknown.

Phenology. Collected in flower and immature fruit in July.

Distribution (Fig. 5). Mexico (Guerrero, Puebla); tropical deciduous forest; 1350 m.

ADDITIONAL SPECIMEN EXAMINED. **Mexico.** GUERRERO: 8 km al NW de Chilpancingo, sobre la carretera a Chichihualco, 1350 m, 7 Jul 1966, *Asteizna* (ENCB), *Cabrera s.n.* (ENCB), *Rzedowski 22755* (DS, ENCB, MICH, TEX).—PUEBLA: [Izúcar de] Matamoros, 24 Jul 1942, *Miranda 2147* (MEXU).

*Galphimia mirandae* has succulent laminas with large, thick-rimmed glands on the margin (Fig. 14a); if the base is decurrent the glands may appear to be borne on the petiole, but careful examination shows them embedded in the laminar tissue. The species is also distinctive in that the pedicels are very long (14.5–18.5 mm) and greatly exceed the peduncles. *Galphimia mirandae* is known from only five gatherings; of these two Puebla collections are from nearby localities, and label data of the Guerrero collections indicate that they were probably obtained from the same population. Additional collections are needed to determine the variability of leaf shape, style length, and ovary and fruit pubescence.

#### GROUP II (petals deciduous; peduncles absent or rudimentary)

**13. *Galphimia angustifolia*** Benth., Bot. voy. Sulphur, 9, pl. 5. 1844. *Thryallis angustifolia* (Benth.) Kuntze, Rev. gen. pl. 1: 89. 1891 [combination also proposed by Rose, Contr. U.S. Natl. Herb. 12: 280. 1909].—TYPE: MEXICO. Baja California Sur: Cape St. Lucas, 1841, *Hinds s.n.* (holotype: K!, photo: MICH!).

*Galphimia linifolia* A. Gray, Gen. amer. bor. 2: 196, pl. 173. 1849. *Thryallis linifolia* (A. Gray) Kuntze, Rev. gen. pl. 1: 89. 1891.—TYPE: U.S.A. [Texas:] banks of the Medina River, Jun 1849, *Wright 93* (lectotype, here designated: GH!; isolectotypes: BM! G! MEL! NY! P! US!).

*Galphimia linifolia* var. *oblongifolia* A. Gray, Pl. Wright, 1: 36. 1852. *Galphimia angustifolia* var. *oblongifolia* (A. Gray) S. Watson, Proc. Amer. Acad. Arts. 24: 42. 1889. *Thryallis angustifolia* var. *oblongifolia* (A. Gray) Vail, Bull. Torrey Bot. Club 22: 228. 1895.—TYPE: U.S.A. [Texas:] banks of the Medina River, Jun 1849, *Wright 94* (holotype: GH!; isotypes: BM! DS! G! K! NY! US!).

*Galphimia angustifolia* var. *ovalifolia* Arènes, Notul. Syst. (Paris) 12: 189. 1946.—TYPE: MEXICO. Sonora: Guaymas, *Palmer 217* in 1887 (lectotype, here designated: P!, photo: MICH!; isolectotypes: BM! C! GH! K! NY! UC! US!). [Cited erroneously by Arènes as “Scott Elliot, Madagascar, sans num. ni loc.”]

Fig. 15.

Suffrutescent herb and small shrub to 1 m; stems densely pubescent when young, glabrescent in age. Vestiture of all vegetative parts of straight to wavy, white to reddish brown, subsessile hairs 0.6–1.5 mm long. Laminas of the larger leaves 2.5–4 cm long, 0.3–2 cm wide, linear to narrowly elliptical or narrowly lanceolate or narrowly ovate to elliptical or ovate, apex acute or apiculate, base acute, glabrous or abaxially

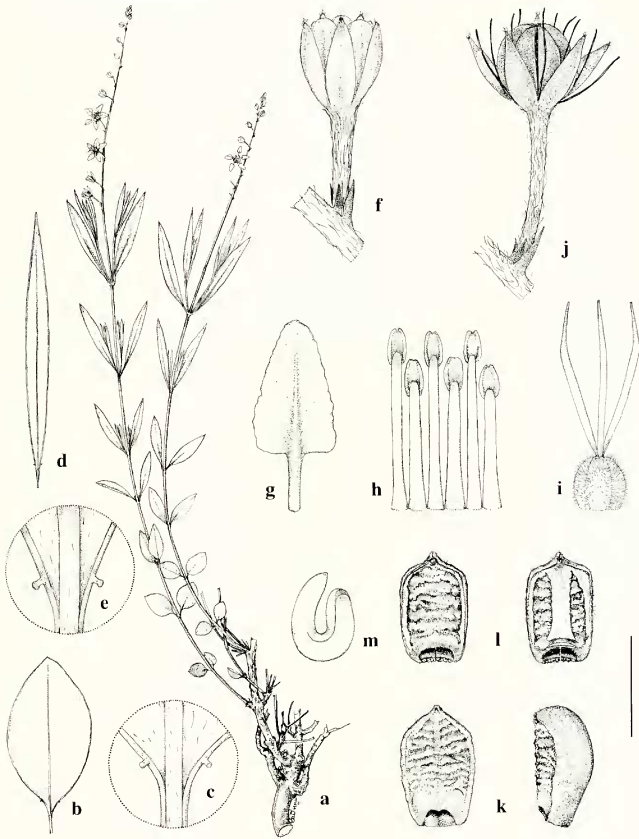


FIG. 15. *Galphimia angustifolia*. a. Flowering habit. b. Wide leaf, adaxial view. c. Base of lamina in "b," abaxial view. d. Narrow leaf, abaxial view. e. Base of lamina in "d," abaxial view. f. Flower bud, with sessile pedicel subtended by bract and two bracteoles. g. Petal. h. Partial androecium laid out, abaxial view, the stamen at right opposite posterior petal. i. Gynoeceum. j. Fruit. k. Two cocci, adaxial view (left) and lateral view (right). l. Two cocci, adaxial views. m. Embryo. Scale bar: a, 4 cm; b, d, 2 cm; c, e, h, i, m, 2 mm; f, j, 4 mm; g, k, l, 2.7 mm. (Based on: a, Pringle 1940, GH; b, c, Reverchon 1505, NY; d, e, Correll 29602, LL; f, Miller et al. 5665, MICH; g-i, McGregor 16749, US; j, l, m, Daniel 6895, CAS; k, Butterwick & Lott 3728, TEX.)

with some scattered hairs on the proximal portion of the costa, secondary veins not evident or slightly prominulous abaxially; margin entire; petioles 0.1–0.9 cm long, pubescent but glabrescent with age; glands usually a pair borne on the margin at the base of the lamina to 5 mm above the base, or sometimes with only 1 gland or rarely the glands absent, each gland 0.1–0.3 mm in diameter, sessile or prominent, or peglike and up to 0.4 mm long, sometimes with 1 or rarely 2 additional smaller glands borne on the margin in the proximal half of the lamina; stipules 2–3.5 mm long, 0.3–0.5 mm wide, linear, glabrous or with scattered hairs on the margin. Inflorescence a terminal raceme, the axes sparsely to densely pubescent but glabrescent in age, peduncles usually absent or rudimentary (rarely to 3.5 mm long), pedicels 2–10 mm long, pubescent or sparsely so; bracts 2–3.7 mm long, 0.5–0.7 mm wide, linear, bracteoles 1.2–1.5 (–1.8) mm long, 0.2–0.3 (–0.5) mm wide, linear, bracts and bracteoles glabrous or with scattered hairs along the margin or only at apex. Sepals 3.2–3.5 mm long, 1.3–1.5 mm wide, narrowly lanceolate, glabrous but with a tuft of hairs at the apex; glands absent. Petals deciduous, subequal, the posterior petal sometimes a little larger, yellow, becoming orange or red in age, glabrous, margin slightly erose-undulate; claw 1.5–2 mm long, 0.4 mm wide, limb 3.5–4.5 mm long, 2.3–3 mm wide, ovate to narrowly triangular, apex obtuse, base subtruncate to acute. Stamens of unequal length; filament opposite anterior sepal 3.7–4 mm long, filaments opposite anterior-lateral petals 2.6–3.5 mm long, filaments opposite anterior-lateral sepals 3.2–3.7 mm long, filaments opposite posterior-lateral petals 2.7–3.3 mm long, filaments opposite posterior-lateral sepals 3.2–3.7 mm long, filament opposite posterior petal 2.5–3.3 mm long; anthers 0.7–0.9 mm long. Ovary pilose, hairs ca. 0.1 mm long; styles 3.5–4.8 mm long. Coccus 3–3.5 mm long, 2–2.2 mm in diameter, pilose, glabrescent in age; areole 2–3 mm long, 1.5–2 mm wide; outer cotyledon 2.3–2.7 mm long, inner cotyledon 1.8–2.2 mm long. Chromosome number unknown.

**Phenology.** Collected in flower and fruit from April through November (–December), in Sonora also in January and February, in Baja California Sur from August through May.

**Distribution** (Fig. 16). U.S.A. (Texas) and Mexico (Baja California Sur, Coahuila, Durango, Nuevo León, San Luis Potosí, Sinaloa, Sonora, Tamaulipas); on limestone, caliche, and gypsum substrates in dry and desert habitats, in washes and arroyos, in open tropical deciduous forest, matorral, and thorn scrub, on dunes; sea level to 1730 m.

**REPRESENTATIVE SPECIMENS.** U.S.A. TEXAS. Bandera Co.: Medina Lake, *Palmer 12269* (A, CAS, GH, MO). Bee Co.: N of Beeville, *Albers 46332* (F, TEX). Bexar Co.: near Bracken, *Groth 64* (CAS, F, GH, US). Blanco Co.: Pedernales Falls State Park, study plot no. 1, *Oefinger 324* (TEX). Brewster Co.: above bed of San Francisco Canyon, ca. 3 mi up from the Rio Grande, ca. 18 mi S of Sanderson, *Butterwick & Lott 3728* (TEX). Comal Co.: Smithson Valley, 15 mi NW of New Braunfels, *Cutler 3248* (F, GH, MO, NY). Duval Co.: 7 mi S of San Diego towards Benavides, *Correll & Johnston 25504* (S, TEX). Edwards Co.: 3/4 mi S of dam on Hackberry Creek, W side below Deadman's Hollow, *Smith & Butterwick 224* (LL). Fayette Co.: without locality, *Matthes 241* (G, W). Goliad Co.: McNamara Ranch, 0.2 mi NE of FM-1351 on S side of Hwy 59, *Hill 5462* (ENCB). Hays Co.: 12 mi W of San Marcos on rd to Wimberly, Edwards Plateau, *Johnson 266* (TEX); San Marcos and vicinity, *Stanfield s.n.* (NY). Jim Hogg Co.: without locality, *Lehmann & Davis 6* (F). Karnes Co.: 0.2 mi W of Coy City, Farm-to-Market Rd 81, *Johnson 1305* (TEX). Kendall Co.: 13 mi NW of Boerne, *Barneby 14496* (CAS, NY). Kerr Co.: *Heller 1737* (BR, C, F, G, GH, K, MICH, MO). Kimble Co.: N of Castroville, *Reverchon 1505* (DS, F, MO, NY, S). Kinney Co.: Anacacho Mts on Anacacho Ranch, *Correll 30433* (GH, MO, TEX). Live Oak Co.: rd to Fiesta Marina just E of Rte 534, 4.6 mi N of Rte 359, *Hill 10628* (ENCB, GH, MICH, MO, NY). Medina Co.: along state farm rd 1283, 4 mi E of Medina Dam, 29°23'N, 99°24'W, *Miller et al. 5841* (MICH, MO). Mendocino Co.: S. Geronimo Valley, *Reverchon 26* (GH). Real Co.: lookout over Frio River, along Rte 83 several mi NE of Leakey, *Correll 29602* (GH, LL). San Patricio Co.: ca. 2 mi NW of Mathis along edge of Frels caliche pit, *Turner 80-86M* (TEX). Starr Co.: 2 km S of Santa Margarita, between Falcon and Roma, *Butterwick & Strong 1335* (TEX).



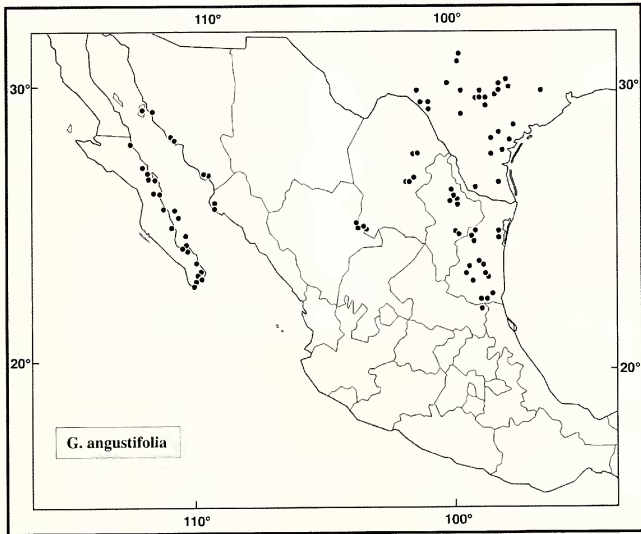


FIG. 16. Distribution of *Galphimia angustifolia*.

Travis Co.: Mount Bonnell, *Albers et al. 46460* (F, MO, NY, S, TEX). Uvalde Co.: 2 mi N of Blewett, *Muller 8013* (LL, MICH). Val Verde Co.: above dam at foot of Devil's Lake, ca. 20 mi NNW of Del Rio, *McVaugh 10589* (BM, DUKE, ENCB, G, GH, MICH, NY, LL); lookout over Frio River, along Rte 83 several mi NE of Leakey, 29°28'N, 100°58'W, *Miller et al. 5665* (MICH, MO, TEX). County unknown: Upper Guadalupe, *Lindheimer 361* (BM, G, GH, K, MO, NY-fragment, P, US, W).

**Mexico.** BAJA CALIFORNIA SUR: E of Cabo San Lucas, *Carter 2259* (DS, MEXU, UC, US); Arroyo del Salto, E of La Paz, 24°12'N, 110°7.5'W, *Carter 2586* (DS, K, UC, US); Cañón de los Potrerillos, ca. 5 km NW of Loreto, 26°01'N, 111°22'W, *Carter 4590* (BM, MEXU, MICH, UC); Caliente Manantiales along Río Agua Caliente, 13 km SW of Santiago, foothills of E slope of Sierra de la Laguna, 23°26'N, 109°49'W, *Daniel 6895* (CAS, MICH); Las Cuevitas below Comondu, *Gentry 4223* (DS, GH, MO, UC, US); Bahía San Nicolás, *Johnston 3736* (CAS, GH, MO, NY, UC, US); Miraflores, *Jones 24169* (A, CAS, F, MO, UC); W side of Santa Cruz Island, 25°17'N, 110°44'W, *Moran 3825* (DS); hill S of Mulegé, 26°52'N, 111°59'W, *Moran 9037* (MICH, SD, UC); Danzante Island, *Moran 9264* (CAS, SD); above Ensenada Ballena, Espíritu Santo Island, 29°29'N, 110°20'W, *Moran 9651* (SD); 10 mi S of Mulegé, *Shreve 7085* (DS, F, MICH, US); 5 mi N of Santiago, *Shreve 7288a* (DS, F, MICH, US); Isla Sta. Catalina, lado SW de la isla, a 10 m de la playa, 25°35'N, 110°47'W, *Sousa, P. 92* (CAS, ENCB, IBUG, IEB, MEXU); Cape Region, Arroyo Santa Anita near Casa Vieja, ca. 5 mi SW of La Palma, 8 mi NW from Santa Anita, *Thomas 7740* (CAS, DS, ENCB, GH, MEXU, UC, US); San José de Magdalena, *Wiggins 11380* (CAS, DS, ENCB, GH, MO, NY, SD, UC, US); 1.5 mi NW of San Bartolo, *Wiggins 14755* (CAS, DS, GH, K, MEXU, TEX, UC); Cape St. Lucas, *Xantus 15* (GH, K, NY, US).—COAHUILA: near Rancho Margarita headquarters, Serranías del Burro Mts, 65 mi NW of Sabinas, *Gould 10649* (ENCB, MICH, TEX); 32 air mi NE of San Pedro, 1 mi SW of Las Delicias, 26°14'N, 102°49'W, *Henrickson 6061* (TEX); 13 km N of Las Margaritas, 26°34'30"N, 102°50'51"W, *Johnston et al. 10357E* (CAS, LL, MEXU, NY); mts 24 mi NE by N from Monclova, *Palmer 128* in 1880 (F, G, GH, NY, US); 5 km NE of Jimuleco, 25°N, 103°W, *Stanford et al. 134* (DS, GH, MEXU, MO, NY, UC); canyons in Sierra del Sobaco a few km W of Las Delicias, *Stewart 2802* (GH); 12.6 km NNE of Las Margaritas, 26°34'N, 102°51'W, *Wendt et al. 9491* (CAS, LL, MEXU, NY); Mpio. Múzquiz, Hacienda Mariposa,

near Puerto Santa Ana, *Wynd & Mueller 282* (A. K. MICH, MO, NY, S. US); Mpio. Torreón, Sierra de Jimulco, 150 km al E de La Mina de San José, 25°06'N, 103°13'W, *Villarreal 5520* (TEX).—DURANGO: 30 km SW of Gómez Palacios, 25°24'30"N, 103°43'W, *Johnston et al. 10400C* (CAS, F. LL, MEXU, MO, NY); 20 km NW of Estación Chocolate, 25°25'N, 103°43'W, *Johnston et al. 12199* (CAS, F. LL, MEXU, MO, NY, SD).—NUEVO LEÓN: 5 mi S of Sabinas Hidalgo, along road to Monterrey near Km 1074, *Chute M-260* (MEXU, MICH); Linares, *Clark 6809* (MO, NY); Mpio. Sabinas Hidalgo, 12.8 mi S of Sabinas Hidalgo, *Cowan 5354* (NY, TEX); ca. 25 km NW of Monterrey, along rd to Nuevo Laredo, *Dieterle 3677* (ENCB, MEXU, MICH); Mpio. Sabinas Hidalgo, 12 mi S of Sabinas Hidalgo, 26°20'N, 100°07'W, *Dorr 2484* (CAS, CHAPA, MEXU, NY, TEX); between Monterrey and Montemorelos, *Dziedkanowski et al. 1736* (ENCB, NY); 11 mi NE of Sabinas Hidalgo, 5 mi SW of Vallecillos, *Johnston & Graham 4607* (MEXU, MICH, TEX); Obispedo, Los Alamillos, *Lacás 408* (F); 29 mi N of Sabinas Hidalgo, *McGregor 16749* (LL, US); Mpio. Villaldama, Sierra Gomas, in Canyon El Alamo, 26°21'N, 100°27'W, *Patterson 6671* (TEX); Monterrey, *Pringle 1940* (BM, F, G, GH, L, NY, S. UC, US, W); hills near Monterrey, *Pringle 2708* (F, MEXU, MO, NY, UC); 40 mi S of Laredo, *Schery 16* (MICH, MO); 7.3 mi S of Sabinas Hidalgo, *Weaver 2024* (DUKE, MEXU, MO).—SAN LUIS POTOSÍ: 3 mi S of Tamaulipas lane on Antiguo Morelos-Valles hwy, *Johnston & Graham 4498* (MEXU, MICH, TEX); without locality, *Parry 94* (GH, K, MO, NY, P, USF).—SINALOA: Cerros del Fuerte, 18–24 mi N of Los Mochis, *Gentry 14291* (LL, MEXU, MICH, US); Cerros de Navachiste about Bahía Topolobampo, *Gentry 14365* (US); hills near Yacht Hotel, Topolobampo, *Hastings & Turner 64-112* (DS, SD); Topolobampo, *Palmer 184* in 1897 (C, DS, MICH, P, S, UC, US).—SONORA: Cañón Nacapuli, ca. 4 km N of Bahía San Carlos, *Felger 85-865* (MICH); Cañón las Barajitas, Sierra El Aguaje, ca. 18 km NW of San Carlos, 28°02'32.0"N, 111°12'40.1"W, *Felger 95-128* (CAS); Ensenada Grande (=San Pedro Bay), *Felger et al. 11570* (SD); 3.6 mi by road NE of New Kino, *Felger 15297* (ENCB, LL, SD); Navjoa, *Gentry 1661* (F, GH, K, MO); Ensenada de Perros, lado E de la Isla Tiburón, 28°46'N, 112°16'W, *Tenorio L. 9503* (TEX); San Agustín Bay, 28°03'N, 111°04'W, *Turner 79-26* (MEXU, U, C); Río Mayo region; base of Cerro (Mesa) Masiaea on rd to microwave tower, 1.3 mi E of Hwy 15 (SE of Navjoa), 26°46'35"N, 109°18'30"W, *Van Devender 95-1090* (MICH).—TAMAULIPAS: Cerro Tinaja, vicinity of San José, Sierra de San Carlos, *Bartlett 10319* (LL, MEXU, MICH, US); La Tamaulipeca, vic. of San Miguel, Sierra de San Carlos, *Bartlett 10582* (ENCB, F, LL, MEXU, MICH, NY, US); Mpio. Ciudad Victoria, 13.6 km from Villa de Casas toward Soto La Marina, *Cowan 5211* (CAS, NY, TEX); along hwy between Gonzáles and Est. Zaragoza, 5.4 mi SE of turnoff to Est. Zaragoza, 23°10'N, 98°44'W, *Daniel 811* (MICH); along rd to San Francisco, 1.0 mi E Hwy 85 S of Cd. Victoria, *Daniel & Baker 3705* (MICH); 4.7 mi W of junction of Hwy 80 & 85 on Hwy 80, along grade W of Antiguo Morelos, *Dunn et al. 17574* (ENCB); 22 mi S of Villagran, *Johnston & Crutchfield 4310A* (TEX); vicinity of Victoria, *Palmer 483* in 1907 (F, GH, NY, US); rd between La Pesca and Soto La Marina, 8.1 mi E of Soto La Marina, 23°51'N, 98°00'W, *Patterson 7272* (TEX); Jau-mave, *Viereck 665* (US).

*Galphimia angustifolia* is a common species of southern Texas and northern Mexico; it is the only species of *Galphimia* found in the United States. It forms sprawling suffrutescent herbs or small shrubs composed of many ascending shoots arising from a woody base and terminating in lax, small-flowered inflorescences. Leaf shape varies greatly from linear to ovate, and some regional patterns can be discerned. In most collections from Baja California Sur and Sonora the laminae are elliptical to ovate, yet in some, including the type of *G. angustifolia*, and those from Sinaloa, the laminae are very narrow. Collections from the remainder of the range have mostly linear to narrowly lanceolate/elliptical laminae, but specimens with broader laminae are not uncommon. On occasion, a specimen bears broader laminae near the base of a shoot and narrower ones distally (Fig. 15a). Superficially *G. angustifolia* is most similar to the equally widespread and variable South American *G. australis*, from which it is readily separated by its pilose ovary and fruit and eglandular calyx. In Mexico *G. angustifolia* is easily differentiated from most other species of *Galphimia* in its range by the broom-like habit, lack of peduncles, and small flowers; the only species sharing these characters is the densely pubescent *G. vestita*.

- 14. *Galphimia vestita*** S. Watson, Proc. Amer. Acad. Arts 21: 421. 1886. *Thryallis vestita* (S. Watson) Rose, Contr. U.S. Natl. Herb. 12: 281. 1909.—TYPE: MEXICO. Chihuahua: Hacienda San Miguel, near Batopilas, *Palmer 187* in 1885 (holotype: GH!, photos: A! F! NY!; isotype: US!).

Fig. 17.

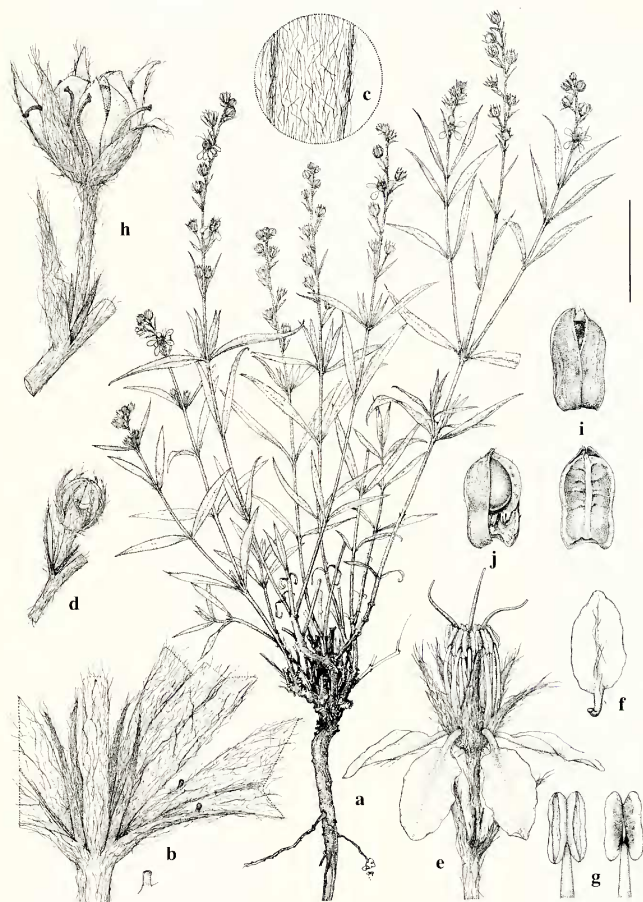


FIG. 17. *Galphimia vestita*. a. Habit. b. Node with stipules (and detached marginal leaf gland). c. Abaxial leaf surface. d. Flower bud, anterior sepal bent down. e. Flower. f. Petal, abaxial view. g. Anthers, adaxial view (left) and abaxial view (right). h. Fruit. i. Cocci, abaxial view (above) and adaxial view (below). j. Coccus with half of abaxial wall removed. Scale bar: a, 4 cm; b, 4 mm (2 mm); c, h-j, 4 mm; d, 5.7 mm; e, f, 5 mm; g, 2 mm. (Based on: a-d, *White 3574*, GH; e-j, *Wiggins 7471*, DS.)

Herb or small shrub from woody rootstock, to 0.5 m; stems, leaves, and inflorescence densely pubescent. Vesture of all parts of white or translucent T-shaped hairs, the trabecula 1–2 mm long, straight to wavy or crisped, the stalk ca. 0.5 mm long. Laminas of the larger leaves 2.5–5 cm long, 0.2–0.8 cm wide, linear, apex acute to acuminate, base acute, secondary veins not evident; margin entire; petioles 1–3 cm long; glands usually a pair borne on the margin to 2 mm above the base of the lamina or sometimes at the base, each gland ca. 0.1 mm in diameter, disklike and prominent, or peglike and up to 0.5 mm long, sometimes the laminar tissue extended into a tooth and the gland borne at the apex; stipules 3.5–9 mm long, 0.5–0.8 mm wide, linear. Inflorescence a terminal raceme; peduncles absent, pedicels 4.5–9 (–11) mm long; bracts 4–14 mm long (often exceeding the pedicel), 0.5–1 mm wide, linear, bracteoles 1.5–2.5 mm long, 0.2–0.3 mm wide, linear. Sepals 4.5–5.3 mm long, 1.5–1.7 mm wide, narrowly triangular to narrowly lanceolate, pubescent abaxially; glands absent. Petals deciduous, subequal, yellow or yellow suffused with red especially on the midrib, becoming red in age, pubescent on the midrib abaxially, margin shallowly erose-undulate; claw ca. 1.5 mm long, 0.3–0.4 mm wide, limb 3.5–5 mm long, 3 mm wide, narrowly ovate or narrowly elliptical, apex obtuse or apiculate, base gradually acute or subtruncate. Stamens subequal; filaments 4–5.5 mm long; anthers 1.3–1.5 mm long. Ovary pilose, hairs ca. 0.1 mm long; styles 6.8–7.8 mm long. Coccus 3.5–4 mm long, 2.3–2.4 mm in diameter, pilose, in age the hairs sloughed off the surface but retained along the sutures; areole 2.8–3 mm long, ca. 2 mm wide; outer cotyledon ca. 2.5 mm long, inner cotyledon ca. 2 mm long. Chromosome number unknown.

Phenology. Collected in flower from July through December, and in fruit from August through October.

Distribution (Fig. 10). Mexico (southwestern Chihuahua, Nayarit, Sinaloa, Sonora); in thorn forest and sandy washes; 400–600 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** NAYARIT: Mpio. El Nayar, Jesús María, camino a la pista de aterrizaje, *Colunga & Zizumbo 42* (CAS, MEXU); Mpio. Acaponeta, near Cancial along trail W of Jesús María, *Norris & Taranto 14063* (MICH), *14085* (MICH).—SINALOA: Cofradia, vic. of Culiacán, 20 Oct 1904, *Brandegee s.n.* (UC); Cofradia, 27 Oct 1904, *Brandegee s.n.* (C, UC); Cienegita, SE of Badiraguato, *Gentry 5939* (ARIZ); Choix, *Gentry 6779* (GH, MICH, NY).—SONORA: El Coyote, in E-central Sonora, *Felger 3616* (ARIZ, ENC, SD); 19.8 mi by rd E of main hwy (Mex. Hwy 15) on rd to Ures, *Felger 3912* (MEXU); Arroyo Guajaray, Río Mayo, *Gentry 1137* (F, GH, K, MEXU, MO, S, UC, WIS); San Bernardo, Río Mayo, *Gentry 2282* (GH, MO); Mpio. Yecora, Curea, 28° 18' 42" N, 109° 16' 42" W, *Reina G. et al. 98-1261* (MICH); near intersection of Hwy 15 and road through Suhural toward San Agustín, *Stevens 1518* (ENCB); Cañón de las Bellotas, region of Río de Bavispe, NE Sonora, *White 3574* (ARIZ, BR, GH, MEXU, MICH); 13 mi S of Divisaderos, *Wiggins 7464D* (DS, US); 14 mi S of Divisaderos, *Wiggins 7471* (DS, MICH, US).

*Galphimia vestita* is easily recognized by its linear and densely pubescent leaves. The only other species with abundant vesture on nearly all its parts is *G. hirsuta* of Guerrero, which has broad laminas; its much larger flowers are borne on pedicels subtended by peduncles and have unequal petals. The androecium of *G. vestita* is unique in the genus in that the stamens are subequal; in all other species at least some stamens have filaments differing in length. *Galphimia vestita* is sometimes misidentified as *G. angustifolia*, which also occurs in northern Mexico and in some populations has linear laminas, but its leaves are glabrous or bear only a few scattered hairs.

- 15. *Galphimia brasiliensis* (L.) Adr. Jussieu in A. St.-Hilaire, Fl. bras. merid. 3: 71. 1833 [“1832”]. *Thryallis brasiliensis* L., Sp. pl., ed. 2, 2: 554. 1762.—TYPE: “Fruticescens herba pisonis, Margr. bras. 79. f. 3” [the illustration; p. 79, in Piso, G.; *De medicina brasiliensi*; Marcgrave, G.; *Historiae rerum naturalium brasiliae*, 1648.]**

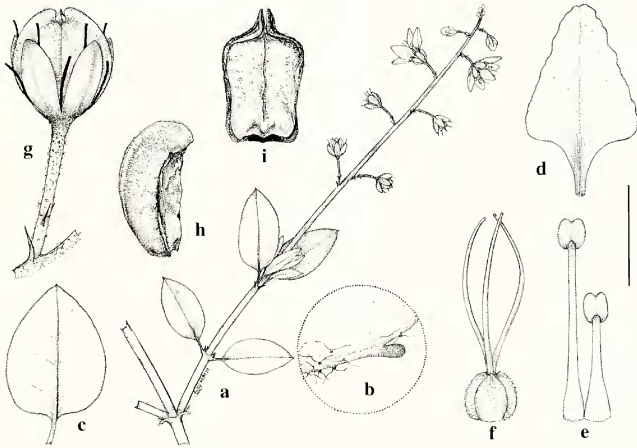


FIG. 18. *Galphimia brasiliensis*. a. Branch with inflorescence. b. Detail of lamina base, showing marginal gland. c. Leaf. d. Petal. e. Stamens opposite posterior-lateral sepal (left) and posterior petal (right), abaxial view. f. Gynoecium. g. Fruit, subtended by calyx and filaments, borne on pedicel and peduncle with portion of inflorescence axis. h. Coccus, lateral view. i. Coccus, adaxial view. Scale bar: a, c, 2 cm; b, 1 mm; d, h, i, 2.7 mm; e, f, 2 mm; g, 4 mm. (Based on: a, d–g, *Anderson 11737*, MICH; b, c, *Harley 16312*, MICH; h, i, *Blanchet 3904*, G.)

*Galphimia brasiliensis* var. *pubescens* f. *ovata* Nied., *Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg* 5: 22. 1914.—TYPE: BRAZIL. Bahia: without locality, 1830, *Salzmann s.n.* (lectotype, designated by C. Anderson, 2005a: G!; isolectotypes: MO! P!).

Fig. 18.

Subshrub and shrub to 1.5 m, often sprawling and scrambling; stems pubescent when young, becoming glabrous but often roughened by tubercles. Vestiture of all vegetative parts of straight to wavy, light brown to white hairs, 0.3–0.8 mm long, each hair borne on a persistent tubercle to 0.25 mm high or the epidermis only slightly raised at point of attachment. Laminas of the larger leaves 2–5 cm long, 1–3.8 cm wide, ovate or elliptical, apex apiculate or acute, base acute to truncate, glabrous but often with a few scattered hairs on the abaxial costa and along the margin near the base, secondary veins prominulous or barely so abaxially; margin entire and commonly with a few persistent tubercles near the base; petioles 0.3–1 cm long, tuberculate-strigose or only the tubercles remaining; leaf glands usually a pair borne on the margin to 0.6 mm above the base of the lamina, sometimes with only 1 gland or the glands absent, each gland 0.1–0.3 mm in diameter, disklike and prominent or sometimes drawn out into a tooth to 0.3 (–0.5) mm long; stipules 1.5–2.7 mm long, 0.3–0.6 wide, linear or very narrowly triangular, with scattered hairs along the margin. Inflorescence a terminal raceme, the axes pubescent and tuberculate; peduncles absent or rudimentary and up to 2 (–3) mm long, glabrate, pedicels 2.5–5.5 mm long, pubescent; bracts 1.2–2 mm

long, 0.4–0.5 mm wide, linear, bracteoles 0.5–0.8 mm long, 0.3–0.4 mm wide, linear, bracts and bracteoles glabrous. Sepals ca. 2.5 mm long, 1–1.1 mm wide, narrowly elliptical, glabrous or with scattered hairs at the base, usually with a tuft of hairs at the apex; glands absent. Petals deciduous, subequal but the posterior petal sometimes with a slightly wider claw, yellow, often marked with red, becoming pink/red in age, glabrous, margin finely denticulate-crose; claw 0.5–1 mm long, 0.4–0.5 mm wide, limb ca. 4 mm long, ca. 3 mm wide, triangular-ovate, apex obtuse, base gradually acute. Stamens of unequal length; filament of stamen opposite anterior sepal ca. 3.5 mm long, filaments of stamens opposite lateral sepals 3.2–3.3 mm long, filaments of stamens opposite petals subequal, ca. 2 mm long; anthers 0.7–0.8 mm long. Ovary finely pilose, the hairs ca. 0.05 (–0.1) mm long; styles 3.3–4.3 mm long. Coccus ca. 3.6 mm long, ca. 2 mm in diameter, finely pilose; areole ca. 2.6 mm long, ca. 1.7 mm wide; mature seed not seen. Chromosome number unknown.

**Phenology.** Collected in flower and fruit throughout the year.

**Distribution** (Fig. 19). Eastern Brazil (Bahia, Paraíba, Pernambuco, Piauí); in caatinga, cerrado, at edges of woods and gallery forests, in thorn scrub; 280–1150 m.

**ADDITIONAL SPECIMENS EXAMINED.** **Brazil.** **BAHIA:** Mpio. Jussiape, estrada Jussiape/Abaíra, ca. 5 km de Jussiape, *Amorim et al.* 2833 (MO); 10 km W of Serrinha on rd to Conceição do Coité, 11°38'S, 39°W, *Anderson* 11737 (CAS, MBM, MICH, NY); Valente, 6 km N of Valente on rd to Santaluz, *Anderson* 13689 (MICH); camino de Filadélfia a Pindobaçu, a 14 km de la BR-407, 10°48'S, 40°14'W, *Arbo et al.* 7334 (CEPEC); BR-324, 12 km NW de Jacobina, camino a Umburanas, 11°06'S, 40°36'W, *Arbo et al.* 7359 (CEPEC); Iaçú, Fda. Lapa, 12°42'S, 39°56'W, *Arouck-Ferreira* 256 (MBM); Pasto Barreiro, Faz. Serra da Monta, Itaberaba, *Bastos* 162 (CEPEC, MICH); *Blanchet* 1046 (G); *Blanchet* 2184 (BM, G); Serra de Jacobina, *Blanchet* 2674 (BM, BR, C, G, MO, NY, P, W); *Blanchet* 3904 (BM, F, G); Conceição de Feira, margem esquerda do Rio Paraguaçu, 12°32'35"S, 39°03'06"W, *Carvalho et al.* 544 (CEPEC, MICH); Barragem de Bananeiras, cachoeira, vale dos Rios Paraguaçu e Jacupé, 12°32'S, 39°05'W, *Cavalo* 201 (CEPEC, MICH); entre Jeremoabo e Paulo Afonso, *Gonçalves* 41 (CEPEC); Lagoa de Eugénia, southern end near Camaleão, *Harley* 16227 (CEPEC); 64 km N of Senhor do Bonfim on BA-130 to Juazeiro, 09°55'S, 40°15'W, *Harley* 16312 (K, MICH, MO, NY, RB); Serra da Jacobina, 8 km N of Senhor do Bonfim on BA-130 to Juazeiro, 10°23'S, 40°15'W, *Harley* 16500 (K, MICH, MO, NY); Piaçã, *Harley* 24152 (K); Milagres, arredores, *Hatschbach* 42452 (MBM, MICH); Itaberaba, Fda. Morros, *Hatschbach* 48206 (BR, CEPEC, MBM, MICH, MO); Morro da Garafã, 12°45'18"S, 39°51'W, *Melo et al.* 2043 (CEPEC); Pasto Buffel, Faz. Serra da Monta, Itaberaba, *Oliveira* 544 (MO); Mairí, *Oliveira* 647 (MO); Faz. Lagôa do Canto, Ipirá, *Oliveira* 682 (MO); Faz. Várzea Ipirá, *Oliveira* 713 (CEPEC, MO); Santa Terezinha, 0.6 km NE de Sta. Terezinha, na estrada entre Sta. Terezinha e Monte Cruzeiro, 12°48'56"S, 39°32'05"W, *Queiroz et al.* 1540 (CEPEC, F, MBM); Santa Inês, Km 20 da Rod. Ubairá/Sta. Inês, *Santos* 3070 (CEPEC, MICH); bei Remonso, *Ule* 7180 (G, L); Santa Luz, 30 km W of Queimadas, 15 km NW of Santa Luz, 11°09'S, 39°28'W, *Webster* 25670 (CAS, MICH).—**PARAÍBA:** without locality, *Coelho de Moraes* 2116 (A, NY, S).—**PERNAMBUCO:** Sertânia, Fazenda Coxí, *Alencar* 3 (MICH); Arca-projeto Suape, Cabo de Sto. Agostinho, parte anterior (Estação D), *Andrade-Lima & Medeiros-Costa* 48 (F, MBM); Praia do Guaibó, 35 km S of Recife, *Deguchi et al.* B-1739 (MO); near Pernambuco, *Gardner* 944 (BM, GH, NY, S, W); 20 km de Petrolina em direção a Afrânio, *Heringer et al.* 185 (UB); 20 km de Petrolina a Afrânio, *Heringer et al.* 975 (RB); *Houillet* s.n. (BR); Olinda, *Pickel* 676 (SP); *Ridley et al.* s.n. (BM); Alagoinha, SW von Caruarú, *Vogel* 129 (MICH).—**PIAUI:** Lagoa Comprida, *Gardner* 2077 (BM, GH).

*Galphimia brasiliensis* is characterized by its pubescence composed of hairs borne on tiny persistent tubercles, mostly ovate leaves, and a finely pilose ovary. The androecium is unique in the genus in that the filaments of stamens opposite the lateral sepals are subequal, as are those of stamens opposite all petals. In all other species, except *G. vestita*, anterior-lateral filaments differ from the posterior-lateral ones.

*Galphimia brasiliensis* is restricted to eastern Brazil (Paraíba to Bahia and adjacent Piauí), but traditionally the name has been applied to any specimen of *Galphimia* from South America, especially to the widespread *G. australis*, which lacks tubercles and has a glabrous ovary and fruit, a (usually) glandular calyx, and a more southern range. Occasionally plants of *G. gracilis* cultivated in South America are

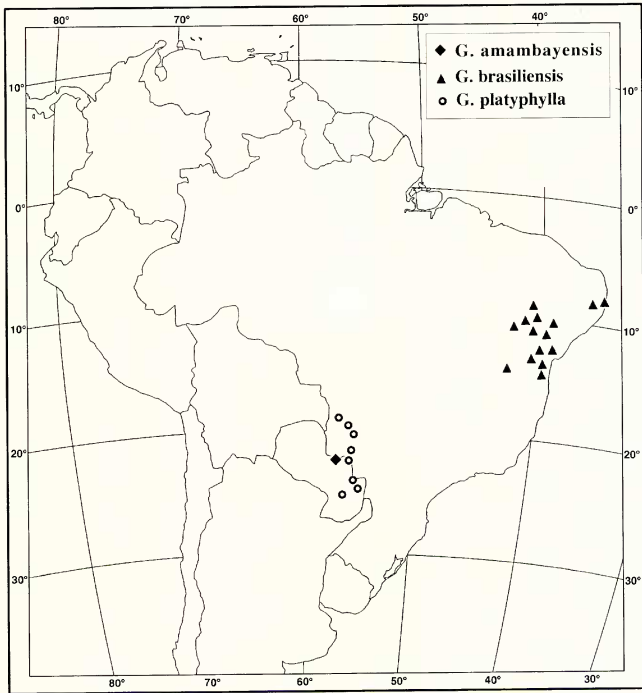


FIG. 19. Distribution of *Galphimia amambayensis*, *G. brasiliensis*, and *G. platyphylla*.

labeled as "*Galphimia brasiliensis*," but they are readily distinguished from true *G. brasiliensis* by their large showy flowers borne on pedicels subtended by peduncles, which bear two bracteoles at or just below the apex.

Jussieu (1833) was the first to realize that Linnaeus's *Thryallis brasiliensis* belongs in *Galphimia* and is not related to species assigned to *Thryallis* Mart., but his description of *G. brasiliensis* was based on specimens of *G. australis*.

**16. *Galphimia australis*** Chodat, Arch. Sci. Phys. Nat., sér. 3, 24: 500. 1890. *Galphimia brasiliensis* var. *australis* (Chodat) Chodat, Bull. Soc. Bot. Genève, sér. 2, 9: 96. 1917.—TYPE: PARAGUAY. Guairá: Prairies de Cosme, entre Villa Rica et Caaguazú, Nov 1874, *Balansa* 2393 (lectotype, designated by C. Anderson, 2005a: G!; isolectotypes: K! P!; photo of P isolectotype: MICH!).

*Galphimia brasiliensis* var. *pubescens* Adr. Juss. in St.-Hil., Fl. bras. merid. 3: 72. 1833 ["1832"].—TYPE: BRAZIL. Rio Grande do Sul: ad ripas Uruguay juxta vicum S.-Francisco de Borja [São Borja], Feb. *St.-Hilaire* C2, 2495bis (holotype: P!, photo: MICH!).

*Galphimia australis* f. *angustifolia* Chodat, Mém. Soc. Phys. Genève 31, part 2, no. 3: 23. 1892. *Galphimia brasiliensis* f. *angustifolia* (Chodat) Nied., Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 5: 22. 1914.—TYPE: PARAGUAY: Guairá; pâturage d'Itangu, près de Villa-Rica, 17 Feb 1876, *Balansa 2394* (holotype: G!).

Fig. 20.

Subshrub or suffrutescent herb from a woody caudex, to 1 m; stems sparsely pubescent when young, soon becoming glabrous, or pubescent and only the oldest parts glabrescent (Rio Grande do Sul and Uruguay). Vesture of all vegetative parts of sessile, mostly wavy or crisped but sometimes straight, reddish brown hairs 0.2–0.7 mm long. Laminas of the larger leaves 2.5–7 (–8) cm long, (0.5–) 1–2.5 (–3.3) cm wide, length/width ratio 2.5–7 (–9), linear to linear-lanceolate to lanceolate to narrowly elliptical, apex apiculate, base acute, glabrous, secondary veins barely prominulous or not evident; margin entire; petioles (0.1–) 0.2–0.6 cm long, glabrous; leaf glands borne on the margin near the base of the lamina or up to 0.8 cm above it, usually a pair, or sometimes with 1 or 2 additional glands, or sometimes only 1 gland or the glands absent, each gland 0.2–0.5 mm in diameter, circular, flush with the margin or prominent or sometimes with a stalk to 0.5 mm long; stipules (1.5–) 2–4.2 (–5) mm long, 0.5–1 mm wide, linear, glabrous. Inflorescence a terminal raceme, the axes often tomentulose in the youngest part, usually becoming glabrate in age, or glabrous throughout; peduncles absent or rudimentary and up to 1.5 (–2.5) mm long, pedicels 2–5 (–10) mm long, tomentulose or with some scattered hairs or sometimes glabrous; bracts 1–5 (–7) mm long, 0.4–1 mm wide, linear, bracteoles 0.5–1.5 (–2) mm long, 0.2–0.5 (–0.7) mm wide, linear, bracts and bracteoles glabrous. Sepals 2.5–3.5 (–4) mm long, 1–1.8 mm wide, oblong, glabrous but with a tuft of hairs at the apex (best seen in bud and early anthesis); glands (0–) 1–3 (–5) per calyx, 0.2–0.5 mm in diameter, prominent. Petals deciduous, subequal, the posterior petal sometimes a little larger, yellow, becoming red in age, glabrous, margin finely denticulate-crose; claw 1.3–1.5 (–1.7) mm long, ca. 0.5 mm wide, limb 3–5 mm long, 2.5–4 mm wide, triangular-ovate, apex obtuse, base acute to truncate. Stamens of unequal length; filament opposite anterior sepal 2.5–3 (–3.4) mm long, filaments opposite anterior-lateral petals 2–2.3 (–2.5) mm long, filaments opposite anterior-lateral sepals 2.3–2.5 (–3) mm long, filaments opposite posterior-lateral petals 1.8–2 (–2.5) mm long, filaments opposite posterior-lateral sepals 2–2.3 (–3) mm long, filament opposite posterior petal (1.8–) 2–2.2 (–2.5) mm long; anthers 1–1.2 mm long. Ovary glabrous; styles 3.5–4.6 (–5.2) mm long. Coccus 3–3.8 mm long, 2–2.5 mm in diameter, glabrous; areole 2.2–3 mm long, 1.6–2 mm wide; outer cotyledon 1.8–2.7 mm long, inner cotyledon 1.5–2 mm long. Chromosome number unknown.

Phenology. Collected in flower and fruit throughout the year.

Distribution (Fig. 21). Southern Brazil, adjacent Bolivia, Paraguay, northeastern Argentina, western Uruguay; open woodlands and grasslands, cerrado, caatinga, campo limpo, campo sujo, matorral, and secondary sites; 90–900 m.

REPRESENTATIVE SPECIMENS. **Argentina.** CORRIENTES: Depto. Santo Tomé, Playadito 17 km W of Apóstoles, *Anderson 12362* (CAS, MBM, MICH, NY); Depto. Santo Tomé, Ayo. Chimiray, *Krapovickas & Cristóbal 25195* (CTES); Depto. Mercedes, Mercedes, a Itá Corá, Ayo. Pay-Ubre, *Quarín & González 2036* (CTES, ENCB); Depto. Berón de Astrada, 46 km W de Itá Ibaté, Valencia, *Schinini 14017* (CTES, F, MICH); Depto. Santo Tomé, Ea. Timbó, Ayo. Ciriaco y ruta 40, *Schinini et al. 23447* (CTES, MICH).—ENTRE RÍOS: Depto. Concordia, Parque Rivadavia, *Burkart & Troncoso 27703* (NY); Depto. Federación, Santa Ana, barranca del Río Uruguay, *Burkart et al. 29359* (CTES, GH); Concepción del Uruguay, *Lorentz 563* (BM, F, G, GH, K).—MISIONES: 9 km al NW de Concepción de la Sierra, *Krapovickas et al. 15148* (C,



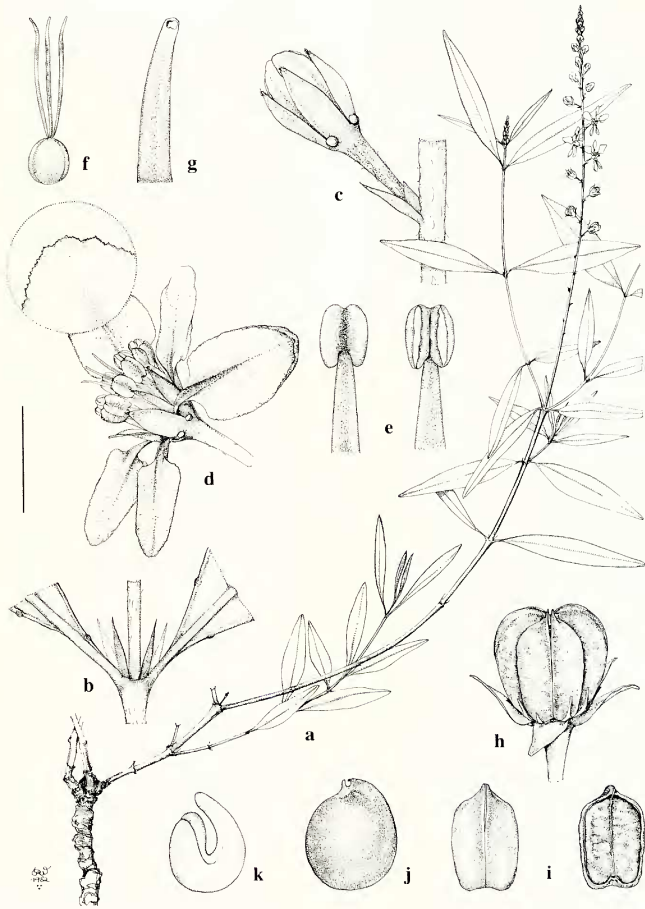


FIG. 20. *Galphimia australis*. a. Habit. b. Node with stipules and basal portion of leaves. c. Flower bud; note calyx glands. d. Flower, side view (adaxial apex of lateral petal enlarged). e. Distal portions of stamens, abaxial view (left) and adaxial view (right). f. Gynoceium. g. Apex of style. h. Fruit. i. Cocci, abaxial view (left) and adaxial view (right). j. Seed. k. Embryo. Scale bar: a, 3 cm; b, 6 mm; c, 3 mm; d, 3.8 mm (3 mm); e, 1.8 mm; f, 3 mm; g, 0.3 mm; h, i, 3.8 mm; j, k, 2.1 mm. (Based on: a–g, *Schinini 14017*, MICH; h–k, *Krapovickas & Schinini 32151*, MICH.)

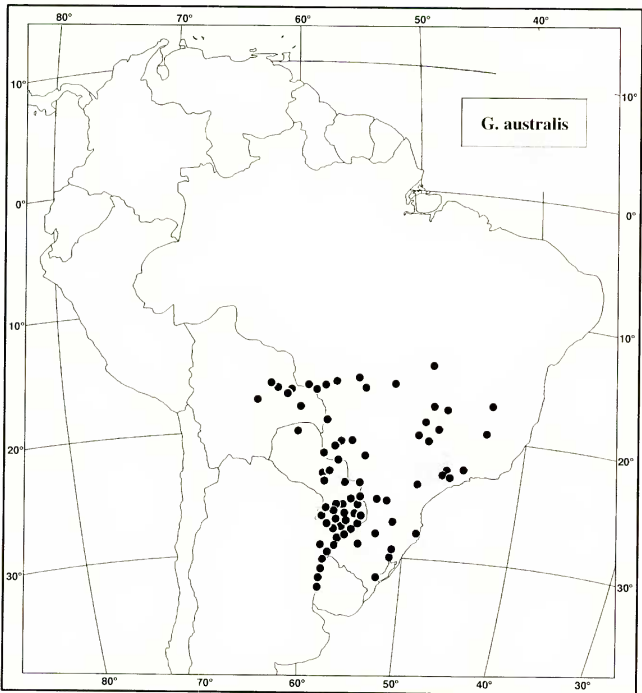


FIG. 21. Distribution of *Galphimia australis*.

CTES, MBM, MO, P, WIS); Depto. Caniguás, Puerto Rico, *Montes 3995* (CTES, MICH); Depto. Apóstoles, Apóstoles, *Xifreda & Maldonado 381* (MBM). **Bolivia.** SANTA CRUZ: Prov. Velasco, San Ignacio, 100 km N comunidad San Miguelito, *Bruderreck 24* (CTES, NY); Prov. Nuño de Chávez, Embocada del Carmen, ca. 40 km SSW de Concepción, 16°38'S, 62°26'W, *Krapovickas & Schinini 32151* (CTES, F, MBM, MICH); Prov. Sandoval, San Matías, 16°21'S, 58°26'W, *Krapovickas & Schinini 36157* (CTES, MICH); Prov. Andrés B Ibáñez, Jardín Botánico de Santa Cruz, 12 km E of center of Santa Cruz on road to Cotoca, *Nee 44434* (NY); Prov. Sara, lomería de Buena Vista, *Steinbach 7370* (A, BM, F, G, GOET, MO, S). **Brazil.** GOIÁS: Mpio. Caldas Novas, 12 km due W of the city of Caldas Novas, *Heringer & Eiten 14190* (HB, K, MO, SP, UB); BR-158, 5 km SE de Aragarças, *Krapovickas & Cristóbal 42948* (K, MBM, MICH).—MATO GROSSO: Oasis, 47 km E de Cáceres, BR-070, Km 680, Serra das Araras, *Krapovickas et al. 40260* (MICH); Mpio. Cuiabá, Rod. BR-070, Contorno Sul, *Hatschbach 65660* (MBM).—MATO GROSSO DO SUL: Mpio. Campo Grande, Rio Anhandui, *Hatschbach 21813* (MBM); Mpio. Rio Brillhante, Rod. BR-267, entroncamento, *Hatschbach 25071* (MBM); Bela Vista, 10–15 km O, *Hatschbach 49160* (BR, G, MBM, US); Mpio. Porto Murtinho, Rod. Bonito—Campo dos Índios, Fazenda Água Doce, *Hatschbach et al. 74009* (MICH); Mpio. Rio Verde, base escarpa de la Serra Alegre, ca. 20 km N de Rio Verde, *Krapovickas 29878* (CTES).—MINAS GERAIS: ca. 5 km SE of Paracatú, *Irwin et al. 26193* (F, MICH, MO, NY); estrada Santo Hipólito a Diamantina, Km 69, *Shepherd et al. 3837* (MBM, NY).—PARANÁ: Ibaré opp., Morungava praedium, *Dusén 17413* (GH, MO, S); Km 127, Mpio. Laranjeiras do Sul, *Hatschbach 23123* (MBM, MICH).—RIO GRANDE

DO SUL: BR-101, Km 6, Campo Bonito, ca. 8 km SW de Torres, *Krapovickas & Cristóbal 38484* (CTES, MICH); I. A. S., Pelotas, *Costa Sacco 407* (F, HB, NY).—SANTA CATARINA: Rod. BR-470, Km 354, Mpio. Campos Novos, *Poliquesti 495* (CEPEC, CTES, MBM, UB).—SÃO PAULO: Dist. Rubião Junior, 1–2 km SW da Faculdade de Ciências Médicas e Biológicas de Botucatu, *Gotsberger & Campos 14-301072* (F, MBM, MICH, UB); Jales, Pastos de Retiro, *Hoehne SPF13903* (MBM, RB). **Paraguay.** ALTO PARANÁ: Ea. Santa Elena, Pira Pyta, *Schinini & Caballero M. 27152* (G, MICH).—AMAMBAY: 32 km SE de Bella Vista, Ayo. Negla, *Schinini 21495* (F, G, MICH).—CAAGUAZÚ: Colonia Pindo, camino entre Itaquyry y Curuguaty, 24°35'S, 55°20'W, *Schinini & Caballero M. 30243* (MICH).—CANENDIYÚ: iter ad Yerbales montium Sierra de Maracayú, in regione fluminis Corrientes, *Hassler 4524* (BM, F, G, GH, K, NY, W).—CONCEPCIÓN: prope Concepción, *Hassler 7572* (BM, G, K, NY).—CORDILLERA: Piribebuy, Colonia Pedro Pablo Caballero, *Rojas 12731* (S, W).—GUAIRÁ: Iturbe, *Montes 12595* (CTES, MICH).—ITAPÚA: Capitán Miranda, 4.2 km N del Hotel Tirol detrás del Barrio CONAVI, *Krapovickas & Cristóbal 44463* (CTES, G, MICH).—MISIONES: 16–17 km S de Santa Rosa, camino a General Delgado, *Arbo et al. 6141* (G, MICH).—ÑEEMBUCÚ: San Juan Bautista, *Purvey 390* (CTES, MO).—PARAGUARI: National Park Ybycu'í, NW corner of park along Arroyo Mina, 26°01'S, 56°46'W, *Zardini & Tilleria 28962* (MO).—PRESIDENTE HAYES: Primavera, *Woolston 192* (NY, S). **Uruguay.** PAYSANDÚ: Chapicuy, orillas del Río Uruguay, Sta. Sofia, *Rosengurt B-3278 1/2* (GH, MO, SP).

*Galphimia australis* is a variable species found in southern Brazil, Bolivia, Paraguay, and eastern Argentina and adjacent Uruguay. Traditionally and in accordance with Niedenzu (1914, 1928) it has been called *G. brasiliensis*, but that name applies to a species restricted to eastern Brazil (see discussion of *G. brasiliensis*, no. 15). *Galphimia australis* is sympatric with *G. platyphylla*, which has very broad laminas and larger flowers, and with *G. amabayensis*, which is readily separated by its tomentulose calyx. In general aspect, it is most similar to the North American *G. angustifolia*, which has a pilose ovary and fruit, and lacks calyx glands, but is also characterized by variation in the shape of the lamina. Most populations of *G. australis* have narrow laminas, ranging from linear to linear-lanceolate to lanceolate to narrowly elliptical, which taper toward the apex and are 3–6 (–9) times as long as wide. Occasionally, some laminas on a specimen are only 2.5 times as long as wide, e.g., *Schinini 14017* and *Schinini et al. 23447* from Argentina. Chodat (1892) assigned specimens with very narrow leaves to his forma *angustifolia*, based on *Balansa 2394* from Paraguay. In some populations some of the leaves on a shoot, or sometimes all, are wider than usual and approach the leaf shape found in *G. amabayensis* and *G. platyphylla* (e.g., *Hassler 4524*, *Hatschbach 25071*, *49160*, *Krapovickas 29878*, *Krapovickas & Cristóbal 25195*), but these specimens match *G. australis* in all other aspects.

A variant from Rio Grande do Sul (Brazil), in which the vesture found on young shoots and inflorescence axes is retained, was named by Jussieu (1833) and accepted by Niedenzu (1914, 1928) as *G. brasiliensis* var. *pubescens*. Such exceptional populations with persistent vesture occur occasionally in other parts of the range as well (e.g., Argentina: *Lorentz 563*, Entre Ríos; *Xifreda & Maldonado 381*, Misiones) and do not merit formal recognition.

Vega et al. (2002) reported the presence of articulated laticifers and production of latex in *G. australis* (as *G. brasiliensis*).

- 17. *Galphimia amabayensis*** C. Anderson, Contr. Univ. Michigan Herb. 24: 2. 2005.—TYPE: PARAGUAY. Amambay: 30 km al N del cruce Bellavista y Pedro Juan Caballero, en matorral, 11 Feb 1982, *Fernández Casas & Molero 6190* (holotype: NY!; isotype: MO!). Fig. 22.

Subshrub to 0.6 m high; stems tomentose when young but becoming glabrous in age. Vesture of sessile, crisped or curled, reddish brown hairs 0.3–0.7 mm long, but straight and appressed on the laminas. Laminas of the larger leaves 4.5–6.5 cm long,

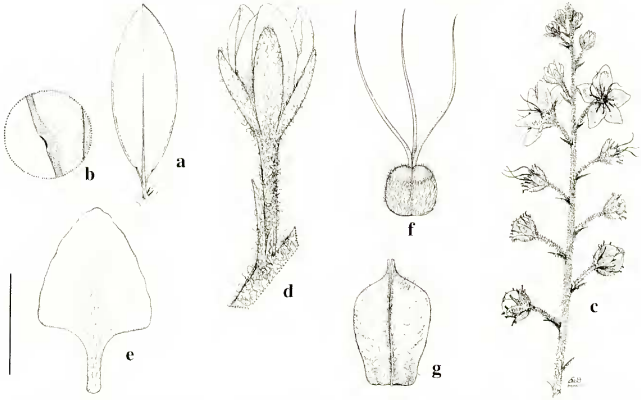


FIG. 22. *Galphimia amambayensis*. a. Leaf. b. Detail of lamina showing marginal gland. c. Portion of inflorescence. d. Opening bud borne on pedicel, with portion of inflorescence axis. e. Petal, abaxial view. f. Gynoecium. g. Coccus, abaxial view. Scale bar: a, 4 cm; b, 8 mm; c, 2 cm; d-g, 4 mm. (Based on Fernández Casas & Molero 6190, NY.)

1.5–2.8 cm wide, elliptical or narrowly so, apex apiculate, base acute, adaxially and abaxially sparsely pubescent when young, mostly glabrous when mature but sometimes with some scattered hairs remaining, secondary veins barely prominent or not evident; margin entire; petioles 0.3–0.6 cm long, glabrous; glands a pair borne on the margin near the base of the lamina or to 0.6 mm above it, each gland 0.4–0.5 mm in diameter, disklike and flush with the margin; stipules 4–4.5 mm long, 0.7–1 mm wide, linear, pubescent on margin and with scattered hairs abaxially. Inflorescence a terminal raceme, the axes densely tomentose, glabrescent in age; peduncles absent or rudimentary, pedicels 4–6.5 mm long, densely tomentose; bracts 2.5–3.5 mm long, 0.7–0.8 mm wide, linear, bracteoles 1.2–1.5 mm long, ca. 0.5 mm wide, linear, bracts and bracteoles abaxially tomentulose or only along the margin. Sepals 3.5–5 mm long, 1.3–1.5 mm wide, narrowly elliptical, abaxially tomentulose or patchily so in age; glands absent. Petals deciduous, subequal, yellow, becoming red in age, abaxially mostly with scattered hairs on the claw and on the limb adjacent to the midrib, or sometimes glabrous, margin very finely denticulate to subentire; claw ca. 2 mm long, ca. 0.5 mm wide, limb 5–5.5 mm long, 4–4.5 mm wide, broadly triangular, apex obtuse, base gradually acute to subtruncate. Stamens of unequal length; filament opposite anterior sepal 3.5–4 mm long, filaments opposite anterior-lateral petals 4–4.5 mm long, filaments opposite anterior-lateral sepals 3.5–4 mm long, filaments opposite posterior-lateral petals 4.5–5 mm long, filaments opposite posterior-lateral sepals 3.8–4.3 mm long, filament opposite posterior petal 4.8–5.2 mm long; anthers ca. 1.3 mm long. Ovary pilose, in the distal 1/3 only on the sutures and adjacent to them, hairs ca. 0.1 mm long; styles 5.5–6.5 mm long. Coccus ca. 4.5 mm long, ca. 3 mm in diameter, pilose but glabrescent in age; areole ca. 4 mm long, ca. 2.5 mm wide; outer cotyledon 3.2–3.4 mm long, inner cotyledon 2.5–3 mm long. Chromosome number unknown.

*Galphimia amambayensis* is known only from the type collected in eastern Paraguay (Fig. 19). It is readily separated from the other South American species by its densely tomentose inflorescence axes and calyx. Like *G. andustifolia* and *G. brasiliensis*, it has a pilose ovary, but in the distal 1/3 the vestiture is present only on the sutures and adjacent to them. The petals bear scattered hairs abaxially though are sometimes glabrous, but in these instance the hairs may have broken off.

**18. *Galphimia platyphylla*** Chodat, Arch. Sci. Phys. Nat. sér. 3, 24: 500. 1890. *Galphimia brasiliensis* var. *platyphylla* (Chodat) Nied. in Chodat & Hassl., Bull. Herb. Boissier, sér. 2, 7: 294. 1907. *Galphimia brasiliensis* f. *platyphylla* (Chodat) Nied., Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 5: 22. 1914.—TYPE: PARAGUAY. Caaguazú: dans les campos, Caaguazú, Nov 1874, *Balansa 2396* (holotype: P!, photo: MICH!; isotype: G!). Fig. 23.

Subshrub to 0.5 m high, from a woody caudex; stems glabrous except for the youngest parts. Vestiture of all vegetative parts of sessile, straight, reddish brown hairs 0.2–0.7 mm long. Laminas of the larger leaves 3–7.5 cm long, (1.5–) 2–4 (–5) cm wide, length/width ratio 1.2–2.3 (–3), elliptical to lanceolate to ovate to broadly ovate, occasionally suborbicular, apex obtuse or acute or sometimes apiculate or emarginate, base acute to truncate, glabrous, secondary veins prominulous or barely so; margin entire; petioles 0.1–0.6 cm long, glabrous; glands usually a pair borne on the margin near the base of the lamina or up to 0.5 cm above it, or sometimes with 1 or 2 additional glands, or sometimes only 1 gland or the glands absent, each gland 0.2–0.5 mm in diameter, flush with the surface or slightly prominent; stipules 2–4 mm long, 0.6–1.2 mm wide, triangular to narrowly so, glabrous or with scattered hairs along the margin. Inflorescence a terminal raceme, the axes with scattered hairs and glabrescent; peduncles absent, pedicels 1.5–8 mm long, 0.7–1 mm wide, glabrous; bracts 1.5–3 mm long, 0.7–1.2 mm wide, triangular, bracteoles 0.7–1.2 mm long, 0.4–0.7 mm wide, triangular, bracts and bracteoles glabrous. Sepals 4–5.7 mm long, 2–2.5 mm wide, elliptical or sometimes oblong, glabrous but with a tuft of hairs at the apex (best seen in bud and early anthesis); glands (0–) 1–5 per calyx, glands 0.3–0.6 mm in diameter. Petals deciduous, subequal, the posterior petal sometimes a little larger, yellow, becoming red in age, glabrous, margin erose-denticulate; claw 2–2.5 mm long, ca. 0.5 mm wide, limb 7–8.5 mm long, (4–) 5–5.5 mm wide, ovate, apex obtuse, base acute or truncate. Stamens of unequal length; filament opposite anterior sepal 3.3–4.5 mm long, filaments opposite anterior-lateral petals 2.7–3.5 mm long, filaments opposite anterior-lateral sepals 3–4 mm long, filaments opposite posterior-lateral petals 2.5–3.3 mm long, filaments opposite posterior-lateral sepals 2.8–3.7 mm long, filament opposite posterior petal 2.5–3.5 mm long; anthers 1–1.2 mm long. Ovary glabrous; styles 4.2–5.3 mm long. Coccus 4–5 mm long, 3–3.7 mm in diameter, glabrous; areole 3–3.5 mm long, 2.5–3 mm wide; mature seed not seen. Chromosome number unknown.

Phenology. Collected in flower and fruit in March and from July through December.

Distribution (Fig. 19). Eastern Paraguay (Amambay, Caaguazú, Canendiyú) and adjacent Brazil (Mato Grosso do Sul); campo, cerrado, campo limpo, open woodlands; 300–400 m.

ADDITIONAL SPECIMENS EXAMINED. **Brazil**. MATO GROSSO DO SUL: Mpio. Camapuã, Capão Redondo, *Hatschbach 33058* (MBM, NY); Mpio. Ponta Porã, Pacorí, *Hatschbach 45921* (BR, G, MBM, MICH); Amambai, rod. p/ Ponta Porã, *Hatschbach 48498* (MBM, MICH); Coxim, 5 km S, *Oliveira 162* (MBM);

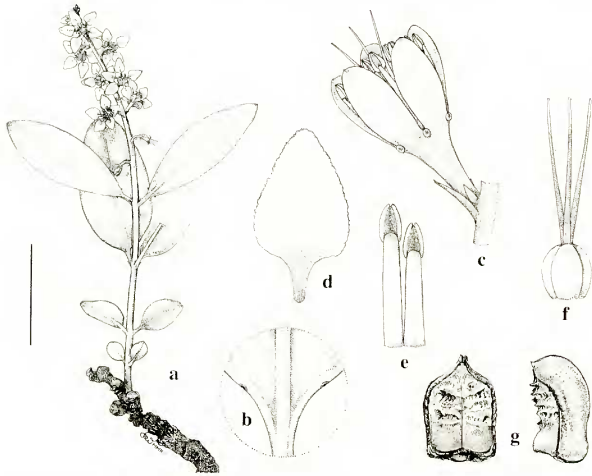


FIG. 23. *Galphimia platyphylla*. a. Habit. b. Base of lamina, showing marginal glands. c. Old flower (the petals fallen) borne on pedicel with portion of inflorescence axis; note calyx glands. d. Petal. e. Stamens, abaxial view, opposite posterior-lateral sepal (left) and posterior petal (right). f. Gynoecium. g. Cocci, adaxial view (left) and lateral view (right). Scale bar: a, 4 cm; b, 8 mm; c, d, 5 mm; e, f, 2.7 mm; g, 4 mm. (Based on: a–c, Hassler 9132, G; d–f, Pedersen 14726, MICH; g, Krapovickas et al. 45943, MICH.)

Mpio. Guía Lopes de Laguna, on rd (BR-267) from Maracajú to Guía Lopes, ca. 12 km W of Ervania, Pedersen 14726 (C, MICH). **Paraguay.** AMAMBAY: SIERRA de Amambay, Hassler 9884 (BM, G, NY, W); alrededores de Pedro Juan Caballero, ruta 5, Krapovickas et al. 45943 (CTES, G, MICH).—CAAGUAZÚ: prope Caaguazú, Hassler 9132 (BM, F, G, GH, K, NY, P, S, W); Ruta 2, Pastoreo, Km A-197, Krapovickas & Cristóbal 13355 (CTES); camino a Ithú, 14 km N de Caaguazú, Schinini et al. 28326 (CTES); Cnia. Pindo, camino entre Itaquiry y Curuguatí, Schinini & Caballero M. 30112 (CTES, MICH); near J. E. Estigarribia, Zardini & Guerrero 49141 (MICH).—CANENDIYÚ: in regiones Yerbalium de Maracayú, Apepú et Tajairaguay [?], Hassler 4327 (BM, F, G, K, NY, P, W); iter ad Yerbales montium Sierra de Maracayú, in regione fluminis Capibary, Hassler 4393 (BM, G, W); Mbaracayú Natural Reserve, around Aguará-Nú, Zardini & Ramírez B. 51023 (MO).—Depto. unknown: "Alto Paraná," 22–23° S, Fiebrig 6348 (G).

*Galphimia platyphylla* is characterized by thick and broad laminas, which vary from broadly elliptical or broadly lanceolate to broadly ovate or even suborbicular; they are only 1.2–2.3 times as long as wide and often have an obtuse apex. In all other species with rudimentary peduncles usually only 1–3 flowers are open at one time, but in *G. platyphylla* a raceme may bear up to seven open flowers (e.g., Hassler 9132). This species has sometimes been included in *G. australis*, which has linear to lanceolate or narrowly elliptical laminas of thinner texture. Also, the flowers and fruits of *G. platyphylla* are larger, and the plants are apparently shorter (to 0.5 m vs. to ca. 1 m tall) although more robust, i.e., the axes tend to be stouter. Shoots of *G. platyphylla* generally are composed of three to four internodes and have a terminal inflorescence; sometimes lateral shoots develop and these follow the same pattern. *Galphimia platyphylla* is also sympatric with *G. amambayensis*, which is easily distinguished by its tomentose inflorescence axes and calyx.

## GROUP III (petals persistent; peduncles present)

19. ***Galphimia glauca*** Cav., Icon. 5: 61, pl. 489. May 1799. *Malpighia glauca* (Cav.) Pers., Syn. pl. 1: 506. 1805 [combination also proposed by Poirlet in Lamarck, Encycl. Suppl. 4: 7. 1816]. *Thryallis glauca* (Cav.) Kuntze, Rev. gen. pl. 1: 89. 1891.—TYPE: based on plants cultivated at the botanical garden in Madrid in October, 1794; provenance of propagules: “[MEXICO: Guanajuato:] Acambaro et Salvatierra,” *Née s.n.* (holotype: MA-475692, microfiche: MICH!, photo: MO!). Fig. 24.

Shrub to 2 (–3) m tall; stems sericeous when young, soon glabrous. Vesture of all vegetative parts of subsessile, mostly straight or wavy, reddish brown hairs 0.2–0.6 mm long. Laminas of the larger leaves (1.5–) 2–5.6 cm long, (0.7) 1.3–3.5 cm wide, elliptical to lanceolate or ovate, rarely suborbicular, apex apiculate, base acute, glabrous, secondary veins prominulous abaxially; margin entire; petioles 0.4–1.5 cm long, sparsely sericeous to soon glabrous; glands usually a pair borne on the margin well above the base of the lamina, sometimes nearer the base, each gland 0.4–0.7 mm in diameter, disklike and sessile, or sometimes peglike and up to 0.5 mm long, occasionally with additional tiny glands along the margin in the proximal half; stipules (1.4–) 2–3 mm long, 0.5–1 mm wide, linear or narrowly triangular, glabrous, with scattered hairs on the margin. Inflorescence a terminal raceme, the axes densely tomentulose; peduncles 3–7.5 mm long, pedicels (6–) 8–12 mm long, both tomentulose, peduncles 0.3–0.8 (–0.9) times as long as pedicels; bracts 2–3 (–4) mm long, 0.5–0.8 mm wide, linear, bracteoles 1.5–2.5 mm long, 0.4–0.5 mm wide, linear, bracts and bracteoles glabrous or with scattered hairs on the margin; bracteoles borne in the distal 1/5–1/4 of the peduncle, subopposite or up to 1 mm apart. Sepals 3–4 mm long, 1.3–2 mm wide, linear to oblong or elliptical, glabrous or with a few scattered hairs at base abaxially, margin irregularly denticulate-erose-ciliate; glands absent. Petals persistent, unequal, yellow, sometimes marked with red in age, glabrous, margin finely denticulate; lateral petals: claw 1.5–2 mm long, 0.5 mm wide, limb 7.5–9.5 mm long, 5–6.5 mm wide, elliptical to lanceolate, apex obtuse to subacute, base gradually attenuate; posterior petal: claw 2.8–4 mm long, 1.3–1.7 mm wide, limb 7.5–9.5 mm long, 7–8.5 mm wide, broadly triangular, apex rounded, base slightly cordate. Stamens of unequal length; filament opposite anterior sepal 4–6 mm long, filaments opposite anterior-lateral petals 3–5 mm long, filaments opposite anterior-lateral sepals 4–7 mm long, filaments opposite posterior-lateral petals 2.2–4 mm long, filaments opposite posterior-lateral sepals 3.8–5.5 mm long, filament opposite posterior petal 2–3.5 mm long; anthers 2.4–3 mm long. Ovary glabrous; styles 5.5–6.7 mm long, Coccus 2.5 mm long, 2 mm in diameter, glabrous; areole 2 mm long, 1.8 mm wide; outer cotyledon 1.8–2 mm long, inner cotyledon 1.3–1.5 mm long. Chromosome number unknown.

Phenology. Collected in flower from May through November, in fruit from May through January.

Distribution (Fig. 25). Mexico (Aguascalientes, Guanajuato, Hidalgo, Jalisco, Nuevo León, Querétaro, San Luis Potosí, Tamaulipas, Zacatecas); in deciduous forest, pine forest, pine-oak forest, matorral, and at roadsides; 700–2300 m.

REPRESENTATIVE SPECIMENS. **Mexico**, AGUASCALIENTES: Mpio. Calvillo, Los Lobos, 17 km al S de Malpaso, *de la Cerda & García R. 885* (ENCB); Mpio. Calvillo, Río Gil, *García R. 2705* (IEB); without locality, *Hartweg 13* (BM, G, GH, K, L, NY, W).—GUANAJUATO: Dolores Hidalgo, *Hernández X. et al. X-2403* (MEXU); 13 km al W de Xichú, sobre la carr. a San Luis de la Paz, *Rzedowski 41562* (ENCB, IEB); Mpio. Atarjea, Casas Viejas, 8 km al S de La Joya, *Ventura & López 6516* (ENCB, IEB, MEXU, MICH);

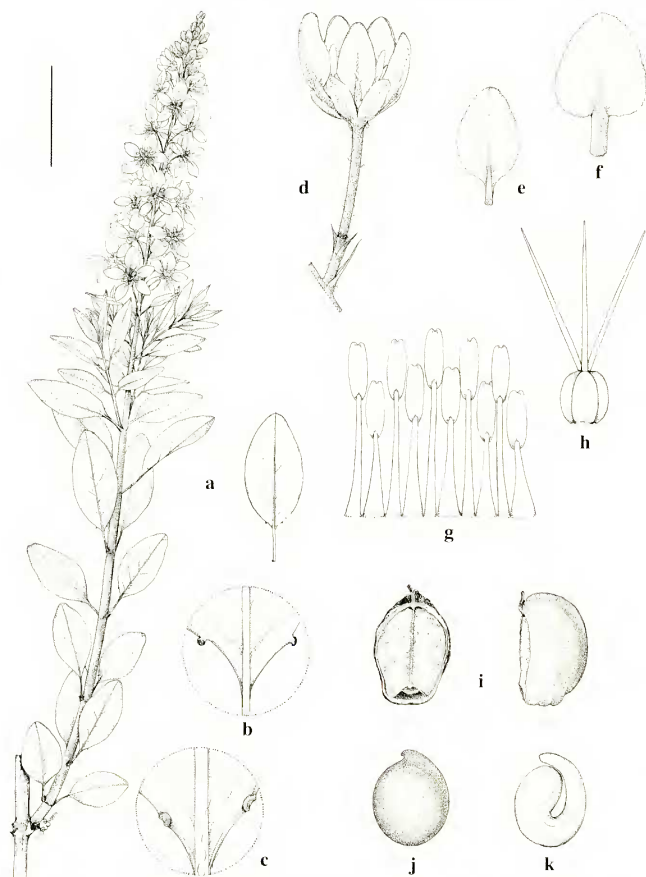


FIG. 24. *Galphimia glauca*. a. Flowering branch, with detached leaf to right. b, c. Base of laminae to show marginal glands. d. Opening flower, borne on pedicel and peduncle with portion of inflorescence axis. e. Lateral petal. f. Posterior petal. g. Androecium laid out, abaxial view, the stamen on right opposite posterior petal. h. Gynoecium. i. Cocci, adaxial view (left) and lateral view (right). j. Seed. k. Embryo. Scale bar: a, 4 cm; b, d-f, 8 mm; c, g, h, 4 mm; i-k, 2.7 mm. (Based on: a, d-h, *Ventura & López 6919*, MICH; b, c, *González 970*, IEB; i-k, *Ventura & López 6516*, MICH.)



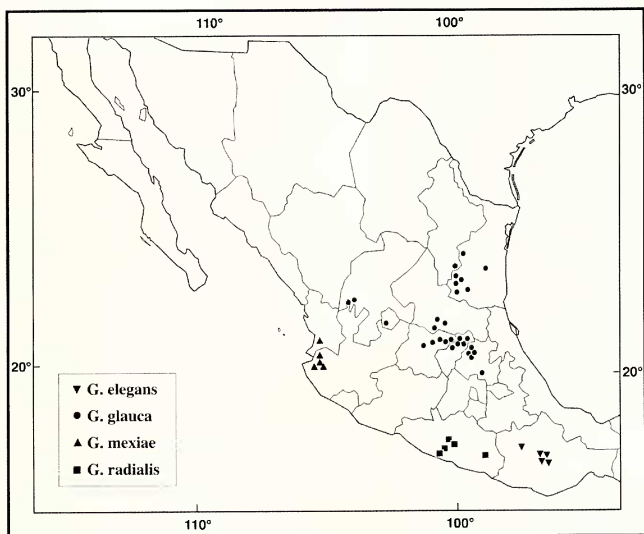


FIG. 25. Distribution of *Galphimia elegans*, *G. glauca*, *G. mexiae*, and *G. radialis*.

Lagunilla, 15 km al N de Victoria, *Ventura & López 6919* (CHAPA, GUADA, IEB, MICH); La Presa, 8 km al N de Doctor Mora, *Ventura & López 7048* (GUADA, IEB, MICH); Mpio. Victoria, Rancho la Luz, *Ventura & López 8481* (IEB, MICH, XAL).—HIDALGO: 2.3 mi NE of Zimapán, Mex. Hwy 85, *Anderson & Laskowski 4027* (DUKE, ENCB, GH, MICH, NY, US); Mpio. Jacala, *Chase 7281* (F, GH, MICH, MO); S of Pachuca, *Clark 7361* (MO, NY); Mpio. Zimapán, 3 km al NE de Zimapán, carr. a Jacala, *García P. 1039* (CAS, CHAPA, ENCB, GUADA, IBUG, LL, MEXU, MICH, TEX, XAL); 40 mi NNW of Ixmiquilpan, *Hitchcock & Stanford 7004* (DS, GH, NY, UC, US); Mpio. Ixmiquilpan, barranca de Tolantongo, 40 km al NE de Ixmiquilpan, *Tenorio 513* (ENCB, UAMIZ, XAL).—JALISCO: descent from Mesa de Cristo to Huejuquilla el Alto, 18 mi by rd SW of Valparaíso, *Anderson & Laskowski 3617* (DUKE, ENCB, GH, MICH, US); Salcillo, *Jones 20* (US).—NUEVO LEÓN: Mpio. Zaragoza, Potreritos, *Hinton et al. 24313* (MEXU, NY, TEX); near El Caracol, 3 mi NE of Dulces Nombres, 24°N, 99°30'–100°30'W, *Meyer & Rogers 2532* (BM, BR, G, GH, MO).—QUERÉTARO: along Hwy 120 between Cadereyta and Vizarrón, 3.5 mi S of Vizarrón, 20°50'N, 99°45'W, *Daniel 378* (CAS, CHAPA, MICH); 6.5 mi W of Colón, *Denton 1996* (ENCB, MICH, UC); Vizarrón, *Zamudio R. 2318* (GUADA, IEB, MICH, MO, TEX); Mpio. Jalpan, 4–5 km al S de La Parada, *Servín 268* (IEB, MICH); Mpio. Landa, Puerto del Malpaís, 3.5 km al NW de El Madroño, *González 970* (IEB); Mpio. Peñamiller, Magüey Verde 17 km al SE de Pinal de Amoles, carr. Pinal de Amoles–Peñamiller, *Tenorio L. 2337* (MEXU, MO); Mpio. Pinal de Amoles, 1 km al NE de El Llano, *Carranza 679* (ENCB, IBUG, IEB, MEXU); Mpio. Tolimán, Rancho Magüey Manso, *Zamudio R. 2203* (IEB).—SAN LUIS POTOSÍ: Km 53, near Las Rusias, ca. 4 mi E of San Francisco, 22°04'N, 100°33'W, *Moran 6339* (MEXU, SD); Km 54 carr. San Luis Potosí–Ríoverde, *Rzedowski 8057* (ENCB, MEXU, MICH, TEX).—TAMAULIPAS: arroyo along Hwy 101, 0.2 mi N of La Presita, 23°15'N, 99°40'W, *Daniel 286* (CAS, ENCB, MICH); Mpio. Jaumave, Alvarez y Urbina, 29 km al N de Magdalena Aguilar (Santiaguillo), *González M. 9731* (MEXU, MICH); Mpio. Bustamante, camino de Felipe Angeles al Ojo de Agua San José, *Hernández 1608* (ENCB, MO, TEX); Mpio. Hidalgo, Los Caballos–Potreritos, *Hinton et al. 24875* (TEX); Mpio. Tula, La Presita, Km 66 carr. Tula–Victoria, *Martínez 1224* (ENCB, MEXU, MO); Mpio. Villa de Casas, rd from Rancho “Las Yucas” to Santa María de los Nogales, *Martínez M. & Borja*

*L. F-1972* (TEX); Mpio. Gómez Farías, camino de Julio a Joya de Salas, *Puig 7173* (ENCB); 6 km W of Miquihuana, 23°42'N, 99°45'W, *Stanford et al. 721* (DS, GH, MO, NY); 3 km N of Huisachal, 30 km from Victoria, *Stanford et al. 2031* (DS, G, UC, US).—ZACATECAS: ridge 2 mi N of Potrero de las Yeguas, 13 mi S of Valparaíso, *McVaugh 17773* (ENCB, MICH).

*Galphimia glauca* is a shrub or suffrutescent herb of northeastern and central Mexico. The flowers are arranged in racemes terminating branches bearing rather small leaves with elliptical to ovate laminas. The leaf glands are borne on the margin of the lamina well above the base (Fig. 24a–c); the glands vary from flush with the margin to prominent or sometimes peglike. The posterior petal has a broadly triangular limb that contrasts with the elliptical to lanceolate limb of the lateral petals. The cocci are the smallest in the genus, only ca. 2.5 mm long and ca. 2 mm in diameter.

The name *Galphimia glauca* has been widely and indiscriminately applied to all Mexican species of *Galphimia* with persistent petals, as well as to some species with deciduous petals, in part because the early introductions of *Galphimia* to horticulture were all so labeled and then widely distributed; for example, Maund's (1837) account and illustration of "*G. glauca*" applies to *G. gracilis*, and Bartling's (1840) treatment of "*G. glauca*" applies to *G. multicaulis*. Most notably the commonly cultivated *G. gracilis*, which has deciduous petals, continues to be identified erroneously as *G. glauca* in the nursery trade and in botanical gardens. Images of "*G. glauca*" in horticultural publications and on websites are almost always of *G. gracilis*. That species is native to eastern Mexico and is partly sympatric with *G. glauca*, from which it differs in addition to the petal characters in its large cocci (4.5–5 mm long), bracteoles placed at or just below the apex of the peduncle, and hairs often borne on tubercles.

The Cavanilles Herbarium, housed at MA, has two sheets of *G. glauca*, MA 475691 and MA 475692. As noted by Garilleti (1993), the sheet annotated by Cavanilles (MA 475692) is the holotype; the other sheet (MA 475691) should not be considered type material.

**20. *Galphimia elegans*** Baillon, *Hist. pl.* 5: 431, figs. 429–435. 1874.—TYPE: specimen taken from plants cultivated at the Jardin des Plantes in Paris (holotype: P!, photo: MICH!).

*Galphimia hirsuta* f. *virescens* K. Koch, *Berliner Allg. Gartenzeitung* 1857(50): 394, t. 9. 1857.—TYPE: based on a living plant cultivated at the botanical garden in Berlin; lectotype, here designated: the illustration in the protologue.

Fig. 26.

Shrub to 3 (–5) m; stems strigose when young, soon becoming glabrous. Vesture of all vegetative parts of subsessile, crisped, reddish brown hairs (0.1–) 0.2–0.8 mm long. Laminas of the larger leaves 3.5–6 cm long, 1.5–3.5 cm wide, narrowly elliptical to lanceolate to ovate to rhombic, apex acute or apiculate, base acute, adaxially sparsely tomentulose to glabrescent in age, abaxially tomentulose, becoming patchily to sparsely tomentulose, eventually glabrescent, secondary veins prominent abaxially; margin entire; petioles 0.8–2 cm long, tomentulose to glabrescent; glands usually a pair placed adjacent or up to 2 mm apart at the middle of petiole or sometimes near the apex of petiole (especially in small/young leaves), sometimes with only 1 gland or the glands absent, each gland 0.4–1.2 mm in diameter, disklike and very prominent, or peglike and up to 1.5 mm long; stipules 1.5–2 mm long, 0.7–1.2 mm wide, linear or narrowly triangular, glabrous. Inflorescence a terminal raceme or sometimes a small panicle, the axes tomentose but patchily so in age; peduncles 3.5–6 (–8) mm long, pedicels 7–10.5 mm long, both tomentulose, peduncles 0.3–0.7 (–1) times as long as

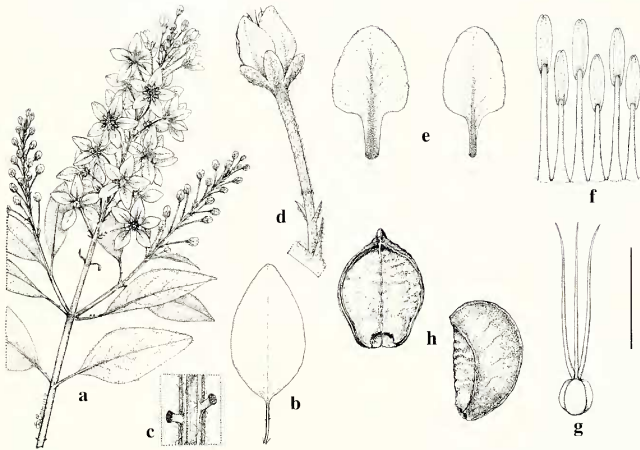


FIG. 26. *Galphimia elegans*. a. Flowering branch. b. Large leaf. c. Detail of petiole to show glands. d. Opening flower, borne on pedicel and peduncle with portion of inflorescence axis. e. Petals, lateral (right) and posterior (left). f. Partial androecium laid out, abaxial view, the stamen on right opposite posterior petal. g. Gynoecium. h. Coccus, adaxial view (left) and lateral view (right). Scale bar: a, b, 4 cm; c, f, g, 4 mm; d, e, 8 mm; h, 2.7 mm. (Based on: a, c–g, *Lorenz 4734*, MEXU; b, *Conzatti 2283*, MEXU; h, *Saynes V. 29*, ENCB.)

pedicels; bracts 1.5–3 mm long, 0.4–0.8 mm wide, linear, bracteoles 1–1.7 mm long, 0.3–0.5 mm wide, linear, bracts and bracteoles tomentulose abaxially; bracteoles borne at middle of the peduncle, subopposite. Sepals 3–3.5 mm long, 1.5–2 mm wide, oblong or elliptical, with scattered hairs, margin irregularly denticulate and distally ciliate; glands absent. Petals persistent, unequal, yellow, glabrous, margin denticulate; lateral petals: claw 1.8–3 mm long, 0.5 mm wide, limb 7–9 mm long, 4.5–5.2 mm wide, lanceolate, apex obtuse, base acute; posterior petal: claw 2–3.5 mm long, ca. 1 mm wide, limb 7–9 mm long, 5–6 mm wide, broadly ovate, apex obtuse to rounded, base truncate or slightly cordate. Stamens of unequal length; filament opposite anterior sepal 5–5.8 mm long, filaments opposite anterior-lateral petals 4–4.3 mm long, filaments opposite anterior-lateral sepals 4.5–4.7 mm long, filaments opposite posterior-lateral petals 3–3.5 mm long, filaments opposite posterior-lateral sepals 5–5.5 mm long, filament opposite posterior petal 3–3.2 mm long; anthers 1.8–2 mm long. Ovary glabrous; styles 6.2–7 mm long. Coccus ca. 3 mm long, ca. 2.5 mm in diameter, smooth, glabrous; areole ca. 2.7 mm long, ca. 2.2 mm wide; mature seed not seen. Chromosome number unknown.

Phenology. Collected in flower and fruit from July through November.

Distribution (Fig. 25). Mexico (Oaxaca); matorral, pine-oak forest, deciduous forest; 1740–2200 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** OAXACA: 1.5 km N of Ixtlán de Juárez, junction on rd to Valle Nacional, *Breedlove 60033* (CAS); cercanías de Oaxaca, *Conzatti 1373* (US); Cerro San Felipe, Dito. Centro, *Conzatti 2283* (F. GH, MEXU); without locality, 1859, *Cuming s.n.* (G, P); along road to

Microondas Nuevas Puntas, 7.7 mi SE jct. rd to Mitla along Hwy 190, *Daniel 1271* (MICH); without locality, 1842, *Franco s.n.* (G); Yavezia, Sep 1844, *Galeotti 4335* (BR, G, K, MEXU, P, W); Yodonocuito, 5 km al E de Teposcolula, Ditto, Teposcolula Mixteca Alta, *García M. 1044* (ENCB, MEXU, MO); without locality, *Karwinski s.n.* (G); Mpio. Ixtlán, Sierra de Juárez, Ruta 175 a 0.5 km al N de Ixtlán, *Lorence 4734* (MEXU, MICH); Playa de Río Culebra, Macuilianguis, *Lucero L-92* (ENCB, MEXU, XAL); Monte Albán, near Oaxaca, *Pringle 4873* (A, BM, BR, G, GH, GOET, MEL, MEXU, MO, NY, S, UC, US, W); Mpio. Oaxaca, Cerro de San Felipe del Agua, *Saynes V. 29* (CHAPA, ENCB, GUADA, IEB, MEXU, MO); Mpio. Oaxaca, Cerro de Donaji, *Saynes V. 852* (IEB, NY, XAL); Jayacatlán, *Smith 83* (GH); Sierra de San Felipe, *Smith 647* (NY); Monte Albán, near Oaxaca, *Smith 648* (MO, NY, UC, US).

*Galphimia elegans* is the only species with persistent petals that has pubescent leaves. Young leaves and those near the inflorescence are abaxially sparsely to abundantly tomentulose; the vesture is composed of reddish hairs, which commonly are sloughed off eventually in age. In larger leaves the glands are borne at about the middle of the petiole and are very prominent or peglike (Fig. 26c); on very short petioles the glands are close to the apex. *Galphimia elegans* is also distinctive in its short anthers (1.8–2 mm long) and distally ciliate sepals. The species is endemic to Oaxaca and sympatric with the variable *G. speciosa* and *G. multicaulis*, which have always glabrous leaves with marginal glands as well as larger anthers (2.2–3 mm long). In addition, the leaves of *G. multicaulis* have rudimentary to very short petioles [0.3–0.8 (–1) mm long].

Although Baillon described *G. elegans* in 1874, the identity of this species and its distinctness have gone mostly unrecognized. The name *G. elegans* was overlooked and is not listed in Index Kewensis and the Gray Index; yet, Baillon's brief description and illustrations fulfill the requirement for valid publication, and there is a holotype at P. The species was introduced to botanical gardens in the 19th century with the name "*G. glauca*," and collections are still commonly so misdetermined. Earlier botanists who noted the presence of leaf vesture misapplied the name *G. hirsuta* to garden plants and herbarium specimens of *G. elegans* (e.g., Bartling 1840; Neumann 1847). Jussieu (1843) cited *Galeotti 4335*, a collection of *G. elegans* with widely distributed duplicates, as an example of *G. hirsuta*, which helped to perpetuate the error (e.g., Koch 1857; Rose 1909; Niedenzu 1914, 1928). Occasionally specimens of *G. elegans* in botanical gardens and in the horticultural trade were also labeled "*Galphimia mollis*"; the name *Galphimia mollis* H. B. K. is a synonym of *Tetrapteryx cotoneaster* Adr. Juss.

**21. *Galphimia speciosa*** C. Anderson, sp. nov.—TYPE: MEXICO, Chiapas: 2.5 km NW of Comitán on rd to San Cristóbal de las Casas, brushy cut-over roadside, 1820 m, 27 Oct 1988, *Anderson 13555* (holotype: MICH!; isotypes: CHAPA! DUKE! IEB! BM! MO! NY!). Fig. 27.

Frutex vel arbor parva. Laminae foliorum majorum 2.5–7 cm longae, 1.5–4 cm latae, ellipticae vel lanceolatae vel ovatae, glabrae, margine integra, glandulis 0.5–1.5 mm diametro, sessilibus vel pedicellatis; petioli 0.8–2.5 cm longi. Inflorescentia racemosa, axibus tomentulosis vel sparse tomentulosis. Petala persistentia; petala lateralalia ungue (1.6–) 2–2.5 mm longo, limbo 7–9 (–10) mm longo, 5–6 (–7) mm lato, oblongo vel ovato; petalum posticum ungue 2.5–3.5 mm longo, limbo 7–8 (–9.5) mm longo, 6–7.8 mm lato, triangulari vel suborbiculari. Antherae 2.3–2.5 (–3) mm longae. Ovarium glabrum; styli 5.5–6 mm longi. Coccus 3.5–4 mm longus, glaber.

Shrub or sometimes a treelet to 3 (–6) m tall; stems strigose to tomentulose when young, soon glabrescent to glabrous. Vesture of all vegetative parts of subsessile, mostly straight or wavy, reddish brown hairs 0.2–0.6 (–0.8) mm long. Laminas of the larger

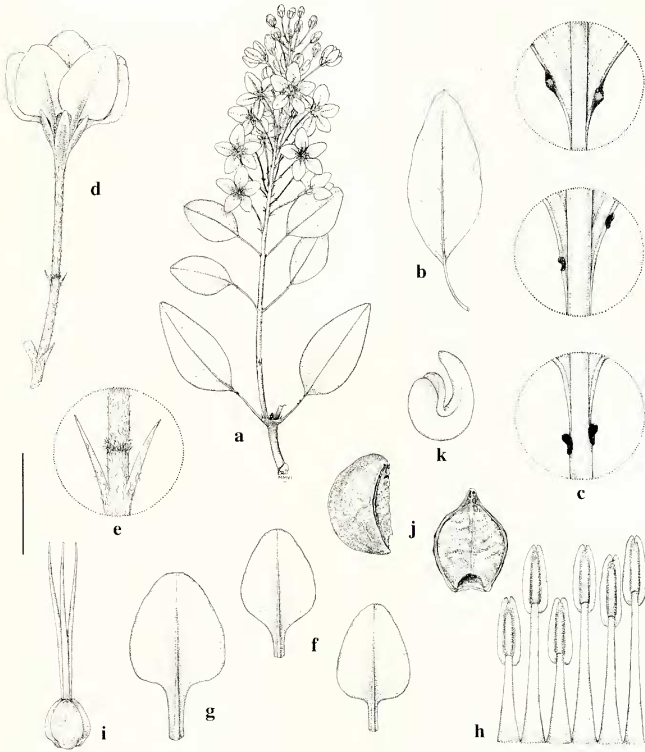


FIG. 27. *Galphimia spectiosa*. a. Flowering branch. b. Detached large leaf. c. Variation in position of glands on petiole and base of lamina. d. Flower subtended by pedicel and peduncle with portion of inflorescence axis. e. Pedicel-peduncle joint with bracteoles on peduncle. f. Lateral petals. g. Posterior petal. h. Partial androecium laid out, abaxial view, the stamen on left opposite posterior petal. i. Gynoecium. j. Cocci, lateral view (left) and adaxial view (right). k. Embryo. Scale bar: a, b, 4 cm; c, h-j, 4 mm; d, 1 cm; e, 2 mm; f, g, 8 mm; k, 2.7 mm. (Based on: a-i, *Anderson 13555, MICH*; j, k, *Prigge 3237, MICH*.)

leaves 2.5–7 cm long, 1.5–4 cm wide, elliptical to lanceolate or ovate, rarely suborbicular, apex acute to apiculate, base acute, glabrous, secondary veins prominent abaxially; margin entire; petioles 0.8–2.5 cm long, with scattered hairs or glabrous; glands usually a pair borne at the base of the lamina or at the apex of the petiole or on decurrent laminar tissue in the distal 1/3–1/2 of the petiole, sometimes with only 1 gland or the glands absent, each gland 0.3–0.8 mm in diameter, disklike and prominent, or sometimes peglike and up to 0.5 mm long; stipules 1.5–2.5 (–3) mm long, 0.5–1 mm wide, linear or narrowly triangular, with scattered hairs along the margin.

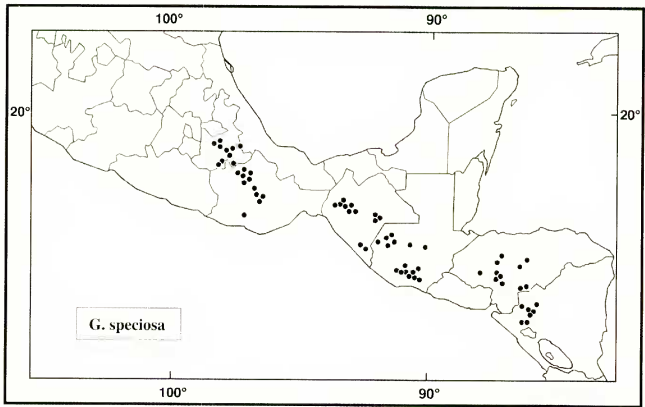


FIG. 28. Distribution of *Galphimia speciosa*.

Inflorescence a terminal raceme, in vigorous plants 3 racemes sometimes aggregated in a leafy ternate panicle, the axes tomentulose, sparsely so in age; peduncles (2.5–) 3–6 (–7.5) mm long, pedicels (6.5–) 8–13 mm long, both tomentulose, peduncles 0.2–0.5 times as long as pedicels; bracts 1.5–2.8 mm long, 0.4–0.8 mm wide, linear to narrowly triangular, bracteoles 1–2 (–2.5) mm long, 0.3–0.5 mm wide, linear, bracts and bracteoles glabrous or with scattered hairs along the margin; bracteoles borne at the apex of the peduncle or in the distal 1/4–1/2, subopposite or up to 0.5 mm apart. Sepals 2.5–3.8 mm long, 1.5–2 mm wide, oblong, glabrous, margin irregularly denticulate-erose and often distally ciliate; glands absent. Petals persistent, unequal, yellow and often marked with red especially on the claw and midrib, glabrous, margin finely denticulate to subentire; lateral petals: claw (1.6–) 2–2.5 mm long, 0.5 mm wide, limb 7–9 (–10) mm long, 5–6 (–7) mm wide, oblong or ovate, apex broadly rounded, base truncate or very briefly acute; posterior petal: claw 2.5–3.5 mm long, 1–1.2 mm wide, limb 7–8 (–9.5) mm long, 6–7.8 mm wide, broadly triangular to suborbicular, apex broadly rounded, base truncate. Stamens of unequal length; filament opposite anterior sepal 4–5.5 mm long, filaments opposite anterior-lateral petals 3–4.5 mm long, filaments opposite anterior-lateral sepals 3.8–5.3 mm long, filaments opposite posterior-lateral petals 2.2–3 (–4) mm long, filaments opposite posterior-lateral sepals 3.5–5 mm long, filament opposite posterior petal 2.2–3 (–4) mm long; anthers 2.3–2.5 (–3) mm long. Ovary glabrous; styles 5.5–6 mm long. Coccus 3.5–4 mm long, 2.7–3 mm in diameter, glabrous; areole 2.5–3 mm long, 2.3–2.8 mm wide; outer cotyledon 3.2–3.5 mm long, inner cotyledon 1.5–1 mm long. Chromosome number:  $n=6$  (Kyhos 1966; W. R. Anderson 1993; both as "*G. glauca*").

Phenology. Collected in flower and fruit throughout the year but most commonly from June through December.

Distribution (Fig. 28). Southern Mexico (southern Puebla and adjacent Veracruz, Oaxaca, Chiapas) and Central America (Guatemala, Honduras, Nicaragua); in subtropical deciduous forest, pine-oak forest, matorral, and at roadsides; (110–) 800–2400 m.

REPRESENTATIVE SPECIMENS. **Mexico.** CHIAPAS: 8.7–9.0 mi N of Tuxtla Gutiérrez on rd to Sumidero, *Anderson 4229* (DUKE, ENCB, GH, MICH, MO, NY, US); 5 km N of Soyaló, rd to Bochil, *Breedlove 21324* (CHAPA, DS, F, LL, MEXU, MICH, MO, NY); Mpio. Totolapa, 6–8 km W of Teopisca on side of Cerro Chenek'ultik, *Breedlove 27081* (CHAPA, DS, MEXU, MICH, MO, NY); Mpio. Berriozábal, 1.3–2.6 km N of Berriozábal toward La Cabaña, 16°48'N, 93°17'W, *Daniel 8369* (MICH); Mpio. Escuintla, Mt. Ovando, *Matuda 16240* (MEXU, MICH, MO, US); Mpio. Escuintla, Buenavista, *Matuda 1878* (DS, F, GH, MEXU, MICH, NY, US); Miramar, *Matuda 395* (LL, MEXU, MICH, US).—OAXACA: 97 km S of Teotitlán on rd to Oaxaca, *Anderson 12991* (CAS, DUKE, IEB, MBM, MEXU, MICH, MO, NY); 20 km SE of Mitla, *Conrad 3044* (GH, MO, SC, XAL); 1 km al S de Magdalena Jicotlán, Dto. Coixtlahuaca, *García M. 1923* (F, MEXU, MICH, MO, UAMIZ, XAL); 2 km W of Tutla on rd to Tamazulapan along Pan-American Hwy, Km 382, *Illis 1333* (F, K, MEXU, MICH, SP, US, WIS); near Tamazulapan, *Nelson 1957* (GH, US); Cerro Solo, ca. 7 km NE of Tepelmeme de Morelos, *Prigge 3237* (ENCB, MEXU, MICH); Mpio. Albarradas, 4 km al NE de San Bartolo Albarradas, camino a Zacatepec, *Rzedowski 37038* (ENCB, IEB, MEXU); 5 km al NE de Teotongo, por la terracería a Tepelmeme, 17°46'N, 97°30'W, *Salinas T. F-3507* (CHAPA, F, MEXU, MO); 2 km al N de Cuyotepeji, carretera a Tehuacán, 17°57'N, 97°41'W, *Salinas T. F-3720* (IEB, MEXU, WIS); Mpio. Concepción Buenavista, Cerro La Culebra, al SW de El Enebro, *Tenorio L. 7143* (MEXU, MO, TEX).—PUEBLA: Santiago Miahuatlán, 18°50'N, *Cházaro B. 652* (MEXU, XAL); ca. 12 km NE de Tehuacán, por la carr. a Esperanza, *Chiang F-270* (CHAPA, IEB, MEXU, MO); vicinity of San Luis Tultitlanapa, Sierra de Mixteca, *Purpus 2733* (BM, F, G, GH, MO, NY, UC, US); Mpio. Caltepec, La Laguna, faldas del Cerro El Gavilán, 2 km al E de Caltepec, 18°10'N, 93°38'E, *Salinas F-3452* (F, IEB, MEXU, MICH, WIS); 2.5–3.5 mi NW of Coacalcoapan, 18°34'N, 97°40'W, *Webster 17239* (DUKE, GH, MEXU, MICH, MO).—VERACRUZ: Acultzingo, Güilupa, *Ventura A. 15419* (ENCB, IEB, MEXU, MO, XAL).

**Guatemala.** ALTA VERAPAZ: Rd to San Juan Chamelco, *Molina R. 12285* (F, LL, NY, US).—CHIMALTENANGO: rd from Chimaltenango to San Martín Jilotepeque, *Standley 57864* (A, ECON, F, MICH, NY, US).—HUEHUETENANGO: entre Naranjales y Boquerón, carretera hacia La Mesilla, *Castillo 1373* (MICH, NY); San Miguel Acatán, *Skutch 999* (A, BM, F, G, NY, US); Canyon of Río Seligua, 40 km NW of Huehuetenango, *Williams 41147* (BM, F, NY, US).—GUATEMALA: Amatitlán, *Riano 834* (US).—QUICHÉ: San Miguel Uspantán, *Heyde 3272* (US).—SACATEPÉQUEZ: Volcán Acatenango, *Smith 2548* (GH, US); near Pastores, *Standley 59913* (F); along Río Guacalate, rd between Antigua and Chimaltenango, *Standley 80988* (F, US).—SANTA ROSA: Barberena, *Heyde 3704* (G, GH, MO, NY, US).—SOLOLÁ: above Panajachel, Lake Atitlán, *Hunnell 14708* (GH, MICH); slopes above Lake Atitlán, 3–5 km W of Panajachel, *Williams 25260* (F, GH, NY, US, WIS). **Honduras.** COMAYAGUA: Km 128 Tegucigalpa–Siguatepéque hwy, *Edwards P-511* (A, F, S, UC, US); entre Las Lajas y Yure, 90 km NW de Comayagua, *Nelson 6054* (MEXU, MO, TEFH).—EL PARAISO: Hac. San Isidro betw. Quebrada El Pescadero and El Paraiso, *Molina R. 18786* (F, NY); Danlí, *Valerio R. 1989* (F).—FRANCISCO MORAZÁN: rd to Agalteca, *Molina R. 18715* (F, GH, NY); Valle de Amateca, 32 km N de Tegucigalpa, *Navarro O. 58* (TEFH, MO).—OLANCHO: Río Juticalpa, 6 km de Juticalpa, *Molina R. 13225* (F, LL, NY, US); Montaña Uval, carretera a San Francisco La Paz, *Molina R. 13327* (F, LL, NY).—YORO: Yoro, *Edwards P-738* (A, F, MO, NY, US); Victoria, orilla del Río Sulaco, *Nelson 7013* (MICH, MO, TEFH). **Nicaragua.** ESTELÍ: Estelí River, 5 km from Estelí, *Molina R. 23031* (NY); SW de Santa Cruz, 1 km de Carretera Panamericana, 13°00'N, 86°18'W, *Moreno 5564* (MICH, MO); San José de Laguna, 13°29'N, 86°21'W, *Moreno 8089* (MICH, MO); along new rd from Hwy 1 (at ca. Km 135.5 and ca. 10.6 km W of bridge at La Trinidad) to San Nicolás, ca. 8.0 km from Hwy 1, *Stevens 10243* (CAS, MEXU, MICH, MO); Llano Almaciguera, 8.4 km S of Hwy 1, just S of Estelí, rd through Estanzuela 2.8 km S of Río Estanzuela bridge, 13°00'N, 86°21'W, *Stevens 10753* (DUKE, ENCB, MICH, MO, TEX); mountains near Estelí, *Williams 10959* (A, F, MICH, UC, US); Río Estanzuela, 8 km SW of Estelí, *Williams 20185* (F, NY, US).—JINOTEGA: camino viejo Matagalpa–Jinotega, ca. 6 km al NO de ciudad Matagalpa, *Grijalva 4027* (MO); ca. 20.3 km NE of Estelí on rd to Yalí, 13°13'N, 86°15'W, *Stevens 15775* (MICH, MO).—LEÓN: camino a San Nicolás, La Guayaba, a 11 km de la Carretera Panamericana, 12°57'N, 86°21'W, *Moreno 17790* (MICH).

*Galphimia speciosa* is widespread and highly variable; future studies may reveal evidence to support recognition of varieties. The shrubs and treelets occur from southern Mexico to northern Nicaragua, but *G. speciosa* has not been recorded from El Salvador. The leaves usually bear the glands on the margin of the lamina near the base or at the apex of the petiole, but the position is variable even on the same shoot. The limb of the all petals is usually triangular, broadly so in the posterior petal, and has a rounded apex, but sometimes the limb of the lateral petals is broadly elliptical to ovate. The only other species with persistent petals occurring within the range of

*G. speciosa* are *G. elegans*, with distal leaves abaxially pubescent, leaf glands borne near the middle of the petiole, and smaller anthers (1.8–2 mm long), and *G. multicaulis*, with rudimentary to very short petioles (even in the largest leaves less than 1 cm long).

- 22. *Galphimia multicaulis*** Adr. Juss., Ann. Sci. Nat. Bot., sér. 2, 13: 327. 1840. *Thryallis multicaulis* (Adr. Juss.) Kuntze, Rev. gen. pl. 1: 89. 1891.—TYPE: MEXICO, Oaxaca: "juxta Huauapan," *Andrieux 496* (holotype: K!; isotypes: G! K! M, P! P-JU, microfiche!; photo of P and P-JU isotype: MICH!; photos of M isotype: F! GH! MICH! MO!). Fig. 29.

Small multi-branched shrub to 1.5 m tall; stems pubescent when young, soon glabrous. Vesture of all vegetative parts of subsessile, crisped, reddish brown hairs 0.2–0.6 mm long. Laminas of the larger leaves 4–8.5 cm long, 2–5.2 cm wide, elliptical to lanceolate or ovate, apex apiculate, base acute, glabrous, secondary veins commonly prominent abaxially; margin entire; petioles 0.3–0.8 (–1) cm long, with scattered hairs abaxially to glabrous; glands borne on the margin near the base of the lamina (to ca. 4 mm above the base) or sometimes at the base, usually a pair but sometimes with an additional gland, or sometimes only 1 gland or the glands absent, each gland 0.3–1 mm in diameter, disklike and prominent, or peglike and up to 1 mm long, sometimes the laminar tissue extended into a tooth; stipules 2–5 mm long, 0.7–1.8 mm wide, triangular, glabrous. Inflorescence a dense terminal raceme, in larger plants the racemes ternate or grouped in a small panicle, the axes tomentulose, glabrescent in age; peduncles 1.5–6.5 mm long, pedicels 3.5–13 mm long, both tomentulose, peduncles 0.1–1.8 times as long as pedicels; bracts 2.2–4.5 mm long, 0.5–1 mm wide, linear, bracteoles 1.5–3 mm long, 0.3–0.7 mm wide, linear, bracts and bracteoles glabrous or with scattered hairs along the margin; bracteoles borne in the proximal 1/4–2/3 of the peduncle, subopposite or up to 1 mm apart. Sepals 2.5–3.8 mm long, 1.4–1.8 mm wide, oblong to elliptical, glabrous, margin entire or finely erose; glands absent. Petals persistent, unequal, yellow, glabrous, margin entire or finely and irregularly denticulate; lateral petals: claw 1.5–2 mm long, 0.5 mm wide, limb 7.5–10 mm long, 4.5–5.2 mm wide, narrowly ovate to narrowly elliptical, apex subacute, base subtruncate or subacute; posterior petal: claw 2–3.5 mm long, 1.2–1.3 mm wide, limb 8–10.5 mm long, 6–7 mm wide, triangular or sometimes ovate, apex obtuse, base truncate or shallowly cordate. Stamens of unequal length; filament opposite anterior sepal 4–5.5 mm long, filaments opposite anterior-lateral petals (3–) 4–5 mm long, filaments opposite anterior-lateral sepals (3.7–) 4–5 mm long, filaments opposite posterior-lateral petals (2.5–) 3.2–4 mm long, filaments opposite posterior-lateral sepals (3.7–) 4.3–5 mm long, filament opposite posterior petal 2.5–3.5 mm long; anthers 2.2–3 mm long. Ovary glabrous; styles 5–6.5 mm long. Coccus ca. 3 mm long, 2–2.6 mm in diameter, glabrous; areole 3 mm long, 2 mm wide; outer cotyledon ca. 2.5 mm long, inner cotyledon ca. 2.3 mm long. Chromosome number unknown.

Phenology. Collected in flower from August through December, in fruit from September through November, in Oaxaca also in flower in June and in bud in May.

Distribution (Fig. 30). Mexico (Guanajuato, Jalisco, Michoacán and adjacent México, disjunct to Oaxaca); pine-oak forest and matorral; 1450–2350 m.

REPRESENTATIVE SPECIMENS. **Mexico**. GUANAJUATO: Mpio. Victoria, Malinto, *Badillo 3* (MICH); Montes de Obrajuelo, 12 Oct 1913, *Salazar s.n.* (MEXU, US).—JALISCO: Mpio. Zapotlán del Rey, Cerro de Santa Fé, *Cházaro B. 5033* (CHAPA, ENCB, IBUG, IEB, XAL); Mpio. Ciudad Guzmán, 20 km al NW de Cd. Guzmán, brecha a Yerbalito, *Fuentes O. 827* (CHAPA, IEB, MICH); Mpio. Jocotepec, Cerro Viejo, vereda a



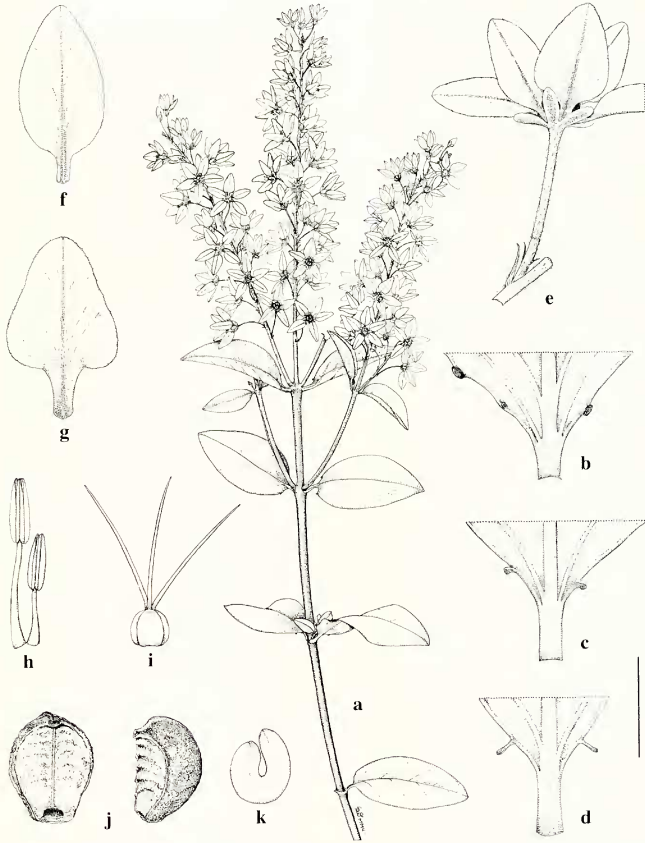


FIG. 29. *Galphimia multicaulis*. a. Flowering branch. b–d. Leaf bases, abaxial view, to show variation in glands. e. Flower borne on pedicel and peduncle, with portion of inflorescence axis. f. Lateral petal. g. Posterior petal. h. Stamens, adaxial view, stamen at right opposite posterior petal, stamen at left opposite posterior-lateral sepal. i. Gynoecium. j. Coci, adaxial view (left) and lateral view (right). k. Embryo. Scale bar: a, 4 cm; b–e, 8 mm; f, g, 5 mm; h, i, 4 mm; j, k, 2.7 mm. (Based on: a, Jones 40975, MO; b, Díaz & Barriga 4760, MICH; c, Machuca N. 4412, XAL; d, e, j, k, King & Soderstrom 4671, MICH; f–i, Cházaro B. 5033, CHAPA.)

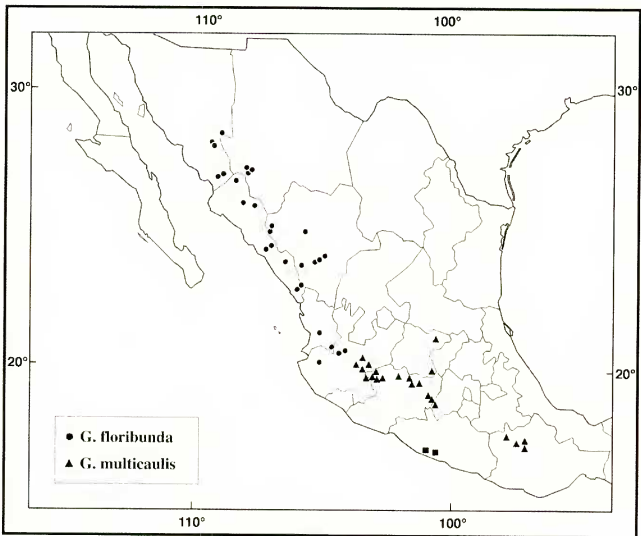


FIG. 30. Distribution of *Galphimia floribunda*, *G. hirsuta*, and *G. multicaulis*.

Barranca del Agua, en frente de Zapotitán de Hidalgo, *Machuca N. 3551* (MICH, XAL); Mpio. Jocotepec, Cerro Viejo, ladera de exposición S, en frente de San Juan Cozalá, 20°15'–30'N, 103°20'–40'W, *Machuca N. 4412* (XAL); Sierra del Tigre, 3 mi S of Mazamiila, *McVaugh 12988* (BM, G. MEXU, MICH, US); base of trail leading to hill towering behind Ixtlahuacán de los Membrillos, off Rt 35 to Chapala, *Norman 661* (MICH); 5 km S of Quitupan, *Villareal 8215* (ENCB, MICH).—MÉXICO: Valle de Bravo, *Lyomet s.n.* (MEXU); 5 km N of Valle de Bravo, *Ripley & Barneby 14869* (CAS, NY).—MICHOACÁN: Cerro de las Nalgas, vic. of Morelia, *Arsène 2654* (MEXU, US); vicinity of Morelia, NW of Pungarato, *Arsène 5164* (A, BM, MO, NY, US); Morelia, Pungarato, *Arsène 8402* (GH, MICH, NY, UC); Mex hwy 15 at San José de Purua rd, *Barr & Barr 64-554* (DS, UC); Mpio. Morelia, entre el Cerro Prieto y El Punhuato, *Díaz B. 4760* (IEB, MICH); Mpio. Morelia, San José Coapa, *Escobedo 1850* (GUADA, IEB, MICH, TEX); slopes of Cerro Santa María, 8–10 km SW of Jiquilpan, 5 km NE of Quitupan, *Feddema 93* (DS, DUKE, ENCB, MICH, TEX); 8 mi S of Zitácuaro, *Jones 40975* (MEXU, MO); Cerro Potrerillos, 5 mi N of Cotija, 22 mi S of Jiquilpan, *King & Soderstrom 4671* (MICH, NY, TEX, UC, US); Mpio. Chilchota, 300 m al NE del pueblo Huancito, *Romero B. 13* (IBUG); Mpio. Huaniqueo, 0.8 km al SW de Tendeparacua, centro NE de pedregal pequeño, *Silva-Saenz 139* (MICH).—OAXACA: Huauclilla, Nochistlán, *Conzatti & González 1199* (GH); Cuesta de Huauclilla, Dto. Nochistlán, *Conzatti 1881* (F, GH, MEXU); Mpio. Nochistlán, Huauclilla, *Conzatti 3965* (MEXU); La Carbonera, Dto. Eila, *Conzatti 4210* (MEXU, US); Nochistlán, Jun 1844, *Galeotti s.n.* (BR); without locality, *Jurgensen 288* (DS, G, K); cuesta de San Juan del Estado, *Pringle 4828* (A, BM, BR, F, G, GH, GOET, MEL, MEXU, MO, NY, S, UC, US, W); prope Oaxaca, *Seler & Seler 98* (GH); mountains near San Juan del Estado, *Smith 82* (GH).

*Galphimia multicaulis* is distinguished by its leaves and the crowded inflorescences. The petioles are very short (usually 3–8 mm long), and the leaf glands, borne on the margin and above the base of the elliptical to ovate laminae, vary from prominent to peglike (Fig. 29b–d). *Galphimia multicaulis* occurs in central Mexico and is also disjunct in northern Oaxaca, where this showy and distinctive species has been

collected only ten times, most recently in 1921 (*Conzatti 4210*). The Oaxacan collections differ only in that they have shorter peduncles (1.5–3 mm long; 0.1–0.4 times as long as pedicels) than specimens from elsewhere (3–6.5 mm long; 0.3–1.8 times as long as pedicels). All but one other species with which *G. multicaulis* is sympatric have well-developed petioles. In Oaxaca the distribution of *G. multicaulis* overlaps with the range of *G. sessilifolia*, a rarely collected species with deciduous petals and sessile to subsessile leaves.

Jussieu noted "v. s. herb. J. Gay" (now at K) in the protologue for *G. multicaulis*. Therefore, I consider the sheet at K from the Gay herbarium, which bears Jussieu's annotation, the holotype; the duplicate at P-JU is an isotype.

*Galphimia multicaulis* was treated by Bartling (1840) under the name *G. glauca* and by Small (1910) under *Thryallis multicaulis*.

**23. *Galphimia paniculata*** Bartl., *Linnaea* 13: 556. 1840 ["1839"]. *Thryallis paniculata* (Bartl.) Kuntze, *Rev. gen. pl.* 1: 89. 1891.—TYPE: MEXICO. "In regno Mexicano," *Hegewisch s.n.* (holotype: GOET!; isotype: NY!).

*Galphimia glandulosa* Cav. [var.]  $\alpha$  *ovalifolia* DC., *Prodr.* 1: 582. 1824.—TYPE: Sessé & Mociño drawing no. 0269, Torner Collection of Sessé and Mociño Biological Illustrations at the Hunt Institute for Botanical Documentation (holotype, digital image!; photos of Candolle copy of drawing at G: F! GH! GOET! MICH! MO!).

*Galphimia glandulosa* Cav. [var.]  $\beta$  *oblongifolia* DC., *Prodr.* 1: 582. 1824.—TYPE: Sessé & Mociño drawing no. 0148, Torner Collection of Sessé and Mociño Biological Illustrations at the Hunt Institute for Botanical Documentation (holotype, digital image!; photos of Candolle copy of drawing at G: F! GH! MICH! MO!).

*Galphimia latifolia* Bartl., *Linnaea* 13: 553. 1840 ["1839"]. *Thryallis latifolia* (Bartl.) Kuntze, *Rev. gen. pl.* 1: 89. 1891, non *Thryallis latifolia* Mart., 1829.—TYPE: Based on plants raised from seed sent by Hunnemann from Mexico in 1837 (holotype: unknown).—Specimen taken from the botanical garden at Göttingen in June, 1840, and preserved in the Bartling Herbarium (neotype, here designated).

*Galphimia humboldtiana* Bartl., *Linnaea* 13: 555. 1840 ["1839"]. *Thryallis humboldtiana* (Bartl.) Kuntze, *Rev. gen. pl.* 1: 89. 1891. *Galphimia paniculata* var. *humboldtiana* (Bartl.) Nied., *Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg* 5: 26. 1914.—TYPE: MEXICO. [Guerrero:] "inter Alto de los Caxones et Acaguisotla," *Humboldt & Bonpland s.n.* (holotype: P-HBK, microfiche: MICH!, photo: MICH!; isotype: P!).

Fig. 31.

Large herb to shrub or treelet to 5 m; stems pubescent when young, soon glabrous. Vesture of all vegetative parts of subsessile, straight to crisped, reddish brown hairs 0.2–0.6 mm long. Laminae of the larger leaves 5–10 cm long, 2–6 cm wide, elliptical to ovate, apex rounded or apiculate, base attenuate, glabrous, secondary veins prominent abaxially; margin entire; petioles 1.5–3.5 cm long, glabrous; glands usually a pair borne at about the middle of the petiole, subopposite or up to 1 mm apart, sometimes with 1 (2) smaller gland(s) distally, each gland 1.5–2 mm in diameter, disklike and prominent; stipules 1–2 (–3) mm long, 0.5–1.5 mm wide, narrowly triangular, glabrous or with scattered hairs on the margin. Inflorescence usually a large panicle composed of racemes (in very young specimens a terminal raceme), the

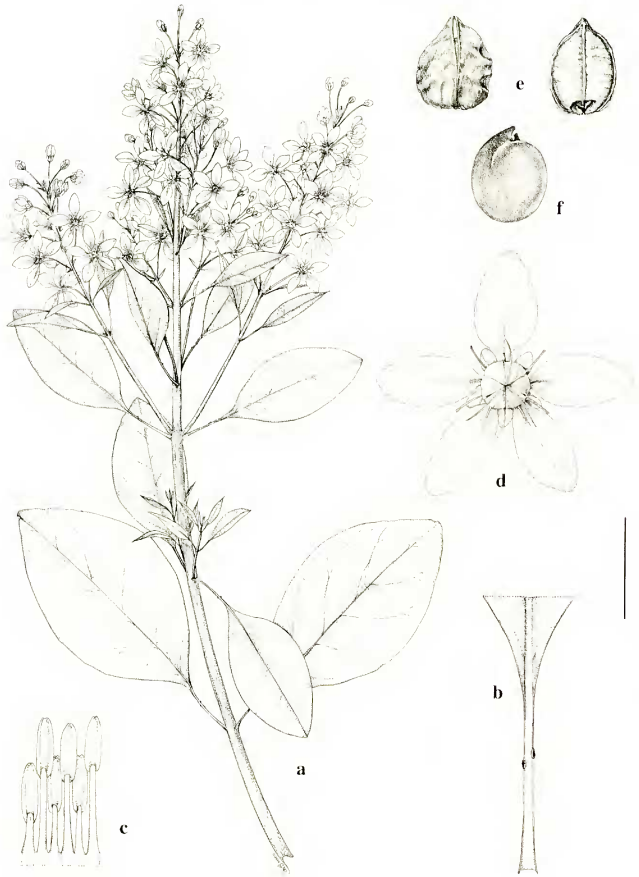


FIG. 31. *Galphimia paniculata*. a. Flowering branch. b. Petiole, adaxial view; note glands. c. Partial androecium laid out, abaxial view, the stamen at left opposite posterior petal. d. Fruit from above, with petals persistent, posterior petal uppermost. e. Cocci, abaxial view (left) and adaxial view (right). f. Seed. Scale bar: a, 4 cm; b, 1.3 cm; c, e, 4 mm; d, 1 cm; f, 2.7 mm. (Based on: a-c, *MacLuca N. 5023*, MICH; d, *McVaugh 14237*, MICH; e, f, *González T. 9*, MICH.)

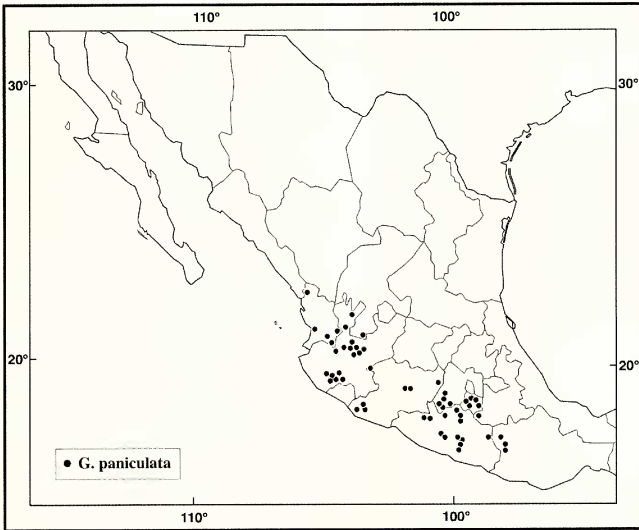


FIG. 32. Distribution of *Galphimia arenicola* and *G. paniculata*

axes pubescent; peduncles 3–7.5 mm long, pedicels (7.5–) 9–13 (–16.5) mm long, both sparsely pubescent to glabrous, peduncles 0.3–0.4 (–0.5) times as long as pedicels; bracts 1.4–3 (–5) mm long, 0.4–0.8 (–1) mm wide, linear, bracteoles 1–2 (–2.8) mm long, 0.3–0.6 mm wide, linear, bracts and bracteoles glabrous; bracteoles borne in the distal 1/4–1/2 of the peduncle, subopposite or up to 2 mm apart. Sepals 3.3–4.5 mm long, 1.4–2.5 mm wide, oblong or narrowly elliptical to linear-lanceolate, glabrous or with a few scattered hairs at base, margin irregularly denticulate-erose-ciliate; glands absent. Petals persistent, unequal, yellow, the claw and midrib often suffused with red, glabrous, margin irregularly finely denticulate; lateral petals: claw 1.3–2 mm long, ca. 0.5 mm wide, limb 8–11 mm long, 4.5–6.5 mm wide, elliptical or lanceolate, apex subacute to obtuse, base gradually attenuate; posterior petal: claw 2–3 mm long, 1.1–1.3 mm wide, limb 9–11 mm long, 6–8 mm wide, ovate or broadly elliptical, apex obtuse, base subacute. Stamens of unequal length; filament opposite anterior sepal 3.5–4.4 mm long, filaments opposite anterior-lateral petals (2–) 2.5–3.5 mm long, filaments opposite anterior-lateral sepals 3.3–4.4 mm long, filaments opposite posterior-lateral petals 1.5–2.5 (–3) mm long, filaments opposite posterior-lateral sepals 3.3–4.2 mm long, filament opposite posterior petal 2–2.8 mm long; anthers 2.3–2.8 mm long. Ovary glabrous; styles (4–) 5.2–6.7 mm long. Coccus 3–3.8 mm long, 2.4–2.7 mm in diameter; glabrous; areole 2.2–2.8 mm long, 1.9–2.5 mm wide; outer cotyledon ca. 3 mm long, inner cotyledon 2–2.5 mm long. Chromosome number unknown. Fig. 31.

Phenology. Collected in flower and fruit from August through April, sometimes also in May and June.

Distribution (Fig. 32). Mexico (Guerrero, Jalisco, México, Michoacán, Morelos, Nayarit, western Oaxaca, Puebla); tropical deciduous and subdeciduous forest, oak and pine-oak forest, pedregal, matorral, roadside, pasture; 700–2220 m.

REPRESENTATIVE SPECIMENS. **México.** GUERRERO: 10 km al NE de Iguala, La Cumbre, desv. a la Torre de Micro-ondas, *Díaz M. 241* (DS, ENCB, MICH, WIS); ca. 8 km (airline) SW of Xochipala, *Feddenna 2773* (DUKE, ENCB, MICH, MO); Manchón, *Hinton 11292* (BM, DS, F, GH, MICH, NY, UC, US); Mpio. Mina, Campo Morado, *Hinton et al. 14846* (GH, LL, MICH, NY, UC, US); Mpio. Chilpancingo, Salto de Valadez a 6 km al N de Mazatlán, *López H. 1030* (ENCB, MEXU); Mpio. Mina, Sierra Madre del Sur, Huenta Vieja, *Mexia 9010a* (GH, UC, US); Mpio. Alcozauca, Alcozauca, Las Mesitas, *Viveros S. & Casas 331* (ENCB, MEXU, MO).—JALISCO: 7 mi NE of Tecolotlán on road to Guadalajara, *Anderson 13564* (MICH); Mpio. Autlán, entre Tecpatlán y Manantlán, 19°37'10"N, 104°12'18"W, *Cárdenas T. et al. 28* (WIS); Mpio. Tequila, 2–3 km adelante de Tequila rumbo al cerro de Tequila, *Cházaro 4386* (IBUG, XAL, WIS); along Hwy 80, ca. 6 mi SW of Casimiro Castillo and ca. 41 mi NE of Cihuatlán, *Clarke et al. 1987-1* (MICH); Mpio. Ixtlahuacán del Río, Los Pitayitos, *González T. 9* (DS, ENCB, IBUG, MICH, TEX, WIS); Mpio. Villa Guerrero, 4 km al NE de El Refugio Bolaños y 26 km al SW de Villa Guerrero, *Lott 2120* (CHAPA, F, IEB, MEXU, MICH, XAL); Mpio. Acatlán de Juárez, "El Cuarenta" al NE de Acatlán, *Machuca N. 5023* (MICH); above Talpa de Allende, near rd to Mascota, *McVaugh 14237* (BM, MEXU, MICH, US); Mpio. Zapopan, cerca de las Timbres, brecha Sta. Lucía–Palo Gordo, *Navarro G 195* (IBUG); Río Blanco, *Palmer 684* in 1886 (GH, MICH, XAL); slopes of barranca near Guadalajara, *Pringle 1728* (A, BM, BR, F, G, GH, MO, NY, S, UC, US, W); barranca de Guadalajara, *Pringle 11391* (CAS, F, GH, L, MICH, MO, S, UC, US); Mpio. Toluimán, Puerto de Toxín, 6 km al S de San Pedro Toxín, *Ramírez S. et al. 208* (IBUG); rd between Bolaños and Guadalajara, *Rose 3021* (NY, US).—MÉXICO: Bejuco, Temascaltepec, *Hinton et al. 2546* (A, G, NY, US); Cerro La Corona, Zacualpan, *Matuda 30349* (MEXU); Tejupileo, *Matuda 27477* (MEXU); Mpio. Valle de Bravo, Cerito de Peña, *Matuda 28046* (MEXU); Mpio. San Tomás, 2 km S of San Nicolás Tolentino, 8 km NE of Zuluapan, 19°09'N, 100°15'W, *Solheim & Benz 1064* (MEXU, XAL, WIS).—MICHOCÁN: Mpio. Villamar, Cerro de Cotijarán, *García 1272* (IEB); brecha a Dos Aguas, *González & Martínez 720* (ENCB, IBUG, MEXU); Mpio. Coacmalán, Coacmalán, *Hinton 12694* (G, LL, MICH, NY, S, UC, US); Mpio. Coacmalán, Aquila, *Hinton 16245* (ENCB, G, LL, MICH, NY, P, UC, S, W); Monte de Sta. Helena, *Langlissé 64* (G, GH, K, P, US); steep dry mountainsides ca. 8 km NW of Aguillilla, rd to Aserradero Dos Aguas, *McVaugh 22665* (ENCB, MICH); Susupuato, *Ramos et al. 588* (MEXU, XAL); a 2 km al SW de Ario de Rosales, *Soto N. 580* (BM, ENCB, MEXU); 26 km al SW de Zitácuaro, entrando por la presa del Bosque, *Torres & Ramírez 13640* (ENCB, IEB, MICH).—MORELOS: Mpio. Xochicalco, zona arqueológica, 3 km al O de la carr. Fed. México–Acapulco, *Anaya R. 8* (CHAPA, F, XAL); Km 16 de la carretera Cuautla–Tepoztlán, *Arreguín 327* (CAS, CHAPA, ENCB, MEXU, NY); Mpio. Tepoztlán, 8 km después de Tepoztlán, rumbo a Sto. Domingo Ocotitlán., *Espejo 3426* (CHAPA, ENCB, MEXU, UAMIZ); Mpio. Yauatepec, 1 km al SE del poblado de La Joya, carr. Cuernavaca–Yauatepec, 18°52'15"N, 99°07'05"W, *Flores F. 366* (IEB, MEXU); entre Cuernavaca et le village de Sochil, *Ghiesbreght 303* (K, P); Mpio. Tlayacapan, near Tlayacapan, rd to Oaxtepec, *Lott 247* (CHAPA); Xochitepec, *Lyonnet 1089* (MEXU); Km 16 carr. Cuautla–Tepoztlán, *Ordorica 160* (CHAPA, ENCB, MEXU, XAL); Cuernavaca, *Pringle 7215* (GH, MICH, US).—NAYARIT: hills back of [town of] Jalisco, *Ferris 5943* (A, DS, US); mountains 20 mi SE of Ahuacatlán on rd to Barranca del Oro and Amatlán, *McVaugh & Koelz 847* (ENCB, G, MICH, NY, US); trail Yxtlán to Barranca del Oro, *Mexia 784* (A, BM, CAS, DS, F, G, GH, MICH, MO, NY, UC); Tepic, *Palmer 2030* in 1892 (BM, C, F, GH, MICH, NY, S, US); Mpio. Huajicóric, Río de los Talladeros, *Solis 604* (ENCB, MEXU, MICH, NY, TEX); Mpio. La Yesca, 6.2 km al SE de Puente de Camotlán, camino a Huajimic, 21°36'N, 104°04'W, *Tenorio L. 16675* (IEB, MEXU).—OAXACA: Arroyo de la Pastor, S. Vicente, Putla, *MacDougall H204* (NY); Mpio. San Juan Mixtepec, SW del Río Timbre, *Sánchez B. 41* (CAS, CHAPA, ENCB, IEB, MEXU, MO, NY); Mpio. San Juan Mixtepec, NW de Loma de Lobo, Dto. Juxtlahuaca, *Sánchez B. 66* (ENCB, IEB, MEXU); 25.5 km al N de Putla, carr. Putla–Huajuapán de León, Distr. Putla, *Torres C. 1956* (CAS, F, MEXU, MO); Mpio. Silacayoapan, Dto. Silacayoapan, 10 km al SE de San Martín del Estado, hacia Silacayoapan, 17°33'N, 98°07'W, *Torres C. 14143* (MEXU, MO, TEX).—PUEBLA: Mpio. Jolalpan, Ejido de Xochitepec, *Arreola et al. Xo-634* (CAS); Mpio. Jolalpan, 2 km al NW de San Pedro de las Palmas, *Ruzo & García 11c-33* (IEB, MEXU).—ZACATECAS: 4 mi N of El Limón, 5.2 mi N of border of Jalisco, *Croat 45091* (MEXU, MO, NY); 8 mi S of Moyahua, *Webster 1081* (ENCB, MICH).

*Galphimia paniculata* is a coarse, showy species commonly collected in western Mexico from Nayarit to westernmost Oaxaca. It is distinguished by its large compound inflorescences and leaves that have the glands borne at the middle of the petiole; the laminae vary from elliptical to ovate. Collections of this species are often

misidentified as *G. glauca* (of eastern and central Mexico), which has smaller leaves with the glands borne on the margin of the lamina and also smaller flowers and fruits; the limb of the posterior petal is broadly triangular. *Galphimia paniculata* is at least partly sympatric with four species with persistent petals, but none have the leaf glands at the middle of the petiole. *Galphimia multicaulis* and *G. calliantha* bear leaf glands on the margin of the lamina well above the base; in addition, *G. multicaulis* differs in its very short petioles (less than 1 cm) and *G. calliantha* in its fringed sepals. *Galphimia floribunda* and *G. grandiflora* have the leaf glands at the base of the lamina or the apex of the petiole; especially in larger laminas, the base may be decurrent with the glands superficially appearing to be borne on the petiole, or the laminar tissue may be drawn out into a tooth terminating in a gland. *Galphimia floribunda* also differs from *G. paniculata* in its almost or completely glabrous inflorescences; *G. grandiflora* is named for its large petals (the limb of the lateral petals 11–15.5 mm long).

Bartling (1840) based his *G. paniculata* on a herbarium collection, but his *G. latifolia* on living plants of the same species with unusually broad laminas, which were grown at the botanical garden in Göttingen. The specimen here chosen as neotype of *G. latifolia* consists only of an inflorescence branch; it is the only specimen I have seen that may have been collected from the plants studied by Bartling, but it is not possible to ascertain whether it is part of the type material. Bartling also provided an additional synonym for *G. paniculata*. He realized that Kunth (1822) had misapplied the name *G. glandulosa* Cav. and provided the name *G. humboldtiana*, which is validated by Bartling's reference to Kunth's description and the *Humboldt & Bonpland* specimen; Bartling also gave a brief description but did not cite any other specimens.

Candolle's varieties of "*Galphimia glandulosa*" were based on drawings prepared for the Sessé and Mociño expedition. That of " $\beta$  *oblongifolia*" is clearly *G. paniculata*. The drawing of " $\alpha$  *ovalifolia*" is quite stylized and there is no specimen in the Sessé and Mociño herbarium (housed at MA); however, at G is a specimen of *G. paniculata* labeled, like the drawing "Tlaxacochitl" and said to be from "Hb. Pavon" (i.e., ex MA), which may be authentic material.

Small (1910) included *G. paniculata*, *G. latifolia*, and *G. humboldtiana* within his concept of *Thryallis glauca*.

**24. *Galphimia calliantha*** C. Anderson, sp. nov.—TYPE: MEXICO. Guerrero: 23–24 km E of Petatlán on rd to Tlapa ["Teapa" on label], Km 123–124, 2000 m, 12–13 Feb 1970, *Anderson & Anderson* 5758 (holotype: MICH!; isotypes: DUKE! ENCB! SD!). Fig. 33.

Frutex vel arbor parva. Laminae foliorum majorum 3–6.5 cm longae, 1.6–3.5 cm latae, oblongae vel ellipticae vel ovatae vel anguste ovatae, glabrae, margine integra, glandulis ca. 0.5 mm diametro; petioli 0.8–1.8 cm longi. Inflorescentia racemosa, axibus tomentosis. Sepala margine ciliata. Petala persistentia; petala lateralia ungue ca. 1.5 mm longo, limbo 10–12 mm longo, 5.5–9.5 mm lato, ovato vel anguste ovato; petalum posticum ungue ca. 2 mm longo, limbo 10.3–12.5 mm longo, 6.5–11 mm lato, ovato-triangulari. Antherae 2.5–2.7 mm longae. Ovarium glabrum; styli 4.5–5.2 mm longi. Coccus ca. 4.5 mm longus, glaber.

Shrub or treelet to 3 m; stems densely tomentose when young, soon glabrous. Vesture of all vegetative parts of subsessile, crisped to curled, reddish brown hairs 0.5–1.5 mm long. Laminas of the larger leaves 3–6.5 cm long, 1.6–3.5 cm wide, oblong to elliptical or narrowly ovate, apex obtuse or apiculate, base acute, glabrous, secondary veins barely prominulous; margin entire; petioles 0.8–1.8 cm long, tomentose

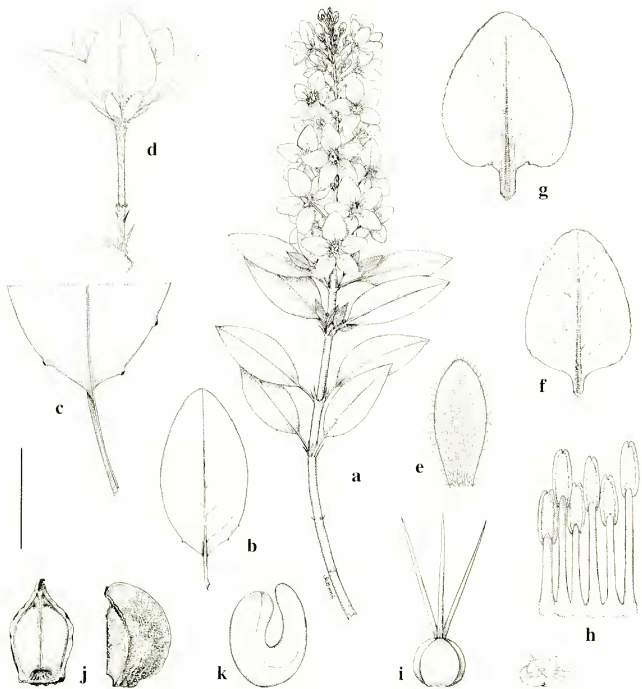


FIG. 33. *Galphimia calliantha*. a. Flowering branch. b. Leaf, abaxial view. c. Base of leaf, adaxial view; note glands on margin. d. Flower, side view. e. Sepal, abaxial view. f. Lateral petal, adaxial view. g. Posterior petal, adaxial view. h. Partial androecium laid out, abaxial view, stamen at left opposite posterior petal. i. Gynoecium. j. Cocci, adaxial view (left) and lateral view (right). k. Embryo. Scale bar: a, b, 4 cm; c, f, g, 8 mm; d, 1.3 cm; e, h-j, 4 mm; k, 2 mm. (Based on: a, d-k, *Rzedowski 18095*, MICH; b, c, *Hinton 9848*, MO.)

when young, becoming glabrous; glands a pair borne on the margin of the lamina, commonly 0.5–1.5 cm above the base, each gland ca. 0.5 mm in diameter, prominent, often with additional glands along the margin, especially in the smaller leaves near the inflorescence; stipules 2.7–4 mm long, 0.8–1 mm wide, narrowly triangular, glabrous. Inflorescence a dense terminal raceme or a ternate panicle, the axes densely reddish tomentose; peduncles 2.5–7 (–9) mm long, pedicels 5–11 (–13) mm long, both tomentose, peduncles 0.3–0.7 (–0.9) times as long as pedicels; bracts 3–5.5 mm long, 0.5–0.8 mm wide, linear, bracteoles 1.6–3 mm long, 0.3–0.5 mm wide, linear, bracts and bracteoles glabrous and with scattered hairs along the margin; bracteoles borne in the distal 1/4–1/2 of the peduncle, subopposite. Sepals 4–4.5 mm long, 1.6–2.2 mm wide, oblong to narrowly elliptical, glabrous or with scattered hairs in the proximal



1/3, margin fringed with reddish hairs to 0.2 (–0.3) mm long; glands absent. Petals persistent, unequal, yellow, the claw often suffused with red, glabrous, margin entire or finely erose; lateral petals: claw ca. 1.5 mm long, ca. 0.5 mm wide, limb 10–12 mm long, 5.5–9.5 mm wide, ovate or narrowly so, apex obtuse, base subacute; posterior petal: claw ca. 2 mm long, 1–1.2 mm wide, limb 10.3–12.5 mm long, 6.5–11 mm wide, triangular-ovate, apex obtuse, base slightly cordate. Stamens of unequal length; filament opposite anterior sepal 4.5–5 mm long, filaments opposite anterior-lateral petals 3.7–4.2 mm long, filaments opposite anterior-lateral sepals 4–4.8 mm long, filaments opposite posterior-lateral petals 3–3.5 mm long, filaments opposite posterior-lateral sepals 4–4.7 mm long, filament opposite posterior petal 3–3.2 mm long; anthers 2.5–2.7 mm long. Ovary glabrous; styles 4.5–5.2 mm long. Coccus ca. 4.5 mm long, ca. 3.5 mm in diameter, glabrous; areole ca. 3 mm long, ca. 2.2 mm wide; outer cotyledon ca. 2.7 mm long, inner cotyledon ca. 2 mm long. Chromosome number unknown.

**Phenology.** Collected in flower from September through March, in fruit from January through May.

**Distribution** (Fig. 35). Mexico (Guerrero and westernmost Oaxaca); in pine-oak forest on limestone; 1600–2200 m.

**ADDITIONAL SPECIMENS EXAMINED.** **Mexico.** GUERRERO: Mpio. Tixtla de Guerrero, Atliaca, entre Acatempa y Atliaca, 17°38'02"N, 99°21'03"W, Hall 778 (MICH); Distr. Mina, Chiriagua, Hinton 9848 (BM, G. MO); Sierra Madre, Langlassé 780 (F, G, GH, K, NY, P, US); Mpio. Chichihualco, 2 km adelante de Cruz de Ocote, Lozano V. 171 (ENCB); Mpio. Chilpancingo de los Bravos, a 2 km al E de Omiltemi, camino a Chilpancingo, Martínez S. & Téllez 285 (MBM, MEXU); Mpio. Chilapa de Alvarez, Km 72–73 de la carretera Chilapa–Tlapa, 17°35'53.1"N, 99°06'02.2"W, Panero 3912 (IEB, TEX); 11 km al W de Amojilca, camino Chilpancingo–Amojilca, Rodríguez B. 65 (ENCB, MEXU, MO); Mpio. Chichihualco, Cruz de Ocote, 25 km al WSW de Camotla, Rzedowski 18095 (DS, ENCB, MICH); Mpio. Chilpancingo, La Simarora, 10 km al E de Omiltemi, Rzedowski 30261 (ENCB, SD); Mpio. Mochilán, El Voladerito, cerca de Coxtlahuacán, Rzedowski 30290 (ENCB); Mpio. Chichihualco, Cruz de Ocote, sobre el camino de Xochipala al aserradero Agua Fría, Rzedowski & McVaugh 284 (ENCB, MICH); W of Chilpancingo, Sharp 441453 (GH); Hwy 134 between Zihuaquío and Ixtapa, crest of mts between Pacific and Río Balsas watersheds, 18°00'N, 101°13'W, Soudé 3228B (MO, TEX).—**OAXACA:** Mpio. Santiago Juxtlahuaca, Dito. Juxtlahuaca, El Manzanal, 17°13'13.20"N, 98°03'38.30"W, Calzada 21372 (CICY, MO).

*Galphimia calliantha* is a handsome shrub or treelet of the pine-oak forests of Guerrero and westernmost Oaxaca. Its large flowers are aggregated in dense racemes with reddish tomentose axes. It is the only species in which the sepals are fringed with reddish hairs along the margin (less obvious in older flowers). The laminae are often apically obtuse and bear the leaf glands on the margin; often several smaller glands are present in addition to the larger pair near the base. The only sympatric species with persistent petals is *G. paniculata*, which has the leaf glands at the middle of the petiole.

**25. *Galphimia grandiflora*** Bartl., *Linnaea* 13: 554. 1840 [“1839”]. *Thryallis grandiflora* (Bartl.) Kuntze, *Rev. gen. pl.* 1: 89. 1891. *Galphimia gracilis* var. *grandiflora* (Bartl.) Nied., *Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg* 5: 24. 1914.—**TYPE:** MEXICO. “In regno Mexicano,” *Hegewisch s.n.* (holotype: GOET!; isotype: NY!)

*Galphimia schiedeana* Nied., *Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg* 5: 28. 1914.—**TYPE:** MEXICO. [Michoacán:] pr. Ario, Dec 1829, *Schiede s.n.* (lectotype, here designated: NY!), fragments from specimen formerly at B, now destroyed; photos of *Schiede s.n.* syntype: F! GH! MICH! MO! NY!).

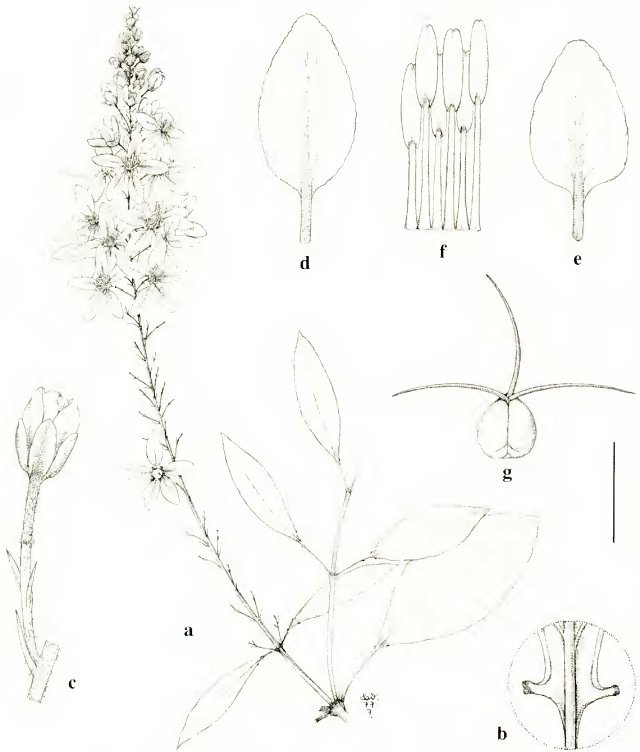


FIG. 34. *Galphimia grandiflora*. a. Flowering branch. b. Base of lamina, abaxial view, showing pair of marginal glands. c. Flower bud, borne on pedicel and peduncle with portion of inflorescence axis. d. Lateral petal. e. Posterior petal. f. Partial androecium laid out, abaxial view, the stamen at left opposite posterior petal. g. Gynoecium. Scale bar: a, 4 cm; b-e, 8 mm; f, g, 4 mm. (Based on: a, c-g, McVaugh 26100, MICH; b, Anderson & Anderson 5881, DUKE.)

Large herb, shrub, or treelet to 5 m tall; stems strigose to tomentulose when young, soon glabrous. Vesture of all vegetative parts of subsessile, straight to crisped, reddish brown hairs 0.2-0.8 mm long. Laminas of the larger leaves 5-13.5 cm long, 2-7.3 cm wide, narrowly to broadly elliptic, ovate, oblanceolate, or rhombic, apex apiculate or rarely acute, base attenuate and often briefly decurrent, glabrous, secondary veins prominent or barely so abaxially; margin entire; petioles 1.5-5 cm long, sparsely strigose to glabrescent; glands a pair borne at the base of the lamina (if base decurrent, gland superficially appearing as borne on the petiole), often at the apex of a tooth of laminar tissue, sometimes on the margin just above the laminar base,

or sometimes one gland at the laminar base and the other at the apex of the petiole, sometimes with 1–2 additional smaller glands on the margin near the base, rarely with only 1 gland, each gland 0.6–1.3 mm in diameter, disklike and prominent, or peglike and up to 1.5 mm long; stipules 2–3.5 (–4.5) mm long, 0.5–1 (–1.5) mm long, linear or narrowly triangular, glabrous, the margin commonly ciliate. Inflorescence a dense terminal raceme or a panicle, the axes tomentulose, sparsely so in age; peduncles 6–11 mm long, pedicels 6–12 mm long, both tomentulose, peduncles (0.5–) 0.6–1 (–1.6) times as long as pedicels; bracts (3–) 4–6.7 mm long, 0.5–0.8 mm wide, linear, bracteoles 2–4 mm long, 0.3–0.5 mm wide, linear, bracts and bracteoles glabrous; bracteoles borne in the distal 1/3–1/2 of the peduncle, mostly subopposite or sometimes up to 1 mm apart. Sepals 4.2–5.5 mm long, 2–2.5 mm wide, elliptical or narrowly so or sometimes oblong, glabrous, margin entire; glands absent. Petals persistent, yellow, the claw often suffused with red, sometimes also the limb in age, the central vein often green, glabrous, margin denticulate; lateral petals: claw 1.8–2.5 mm long, 0.5–0.7 mm wide, limb 11–15.5 mm long, 6–9 mm wide, elliptical to lanceolate, apex subacute, base attenuate; posterior petal: claw 2–3 (–3.5) mm long, 1–1.5 mm wide, limb 11.5–15.5 mm long, 7–9 mm wide, ovate or broadly elliptical, apex subacute, base attenuate. Stamens of unequal length; filament opposite anterior sepal 4.3–5.5 mm long, filaments opposite anterior-lateral petals 3.5–4.3 mm long, filaments opposite anterior-lateral sepals 3.8–5 mm long, filaments opposite posterior-lateral petals 3–4 mm long, filaments opposite posterior-lateral sepals 4–5.2 mm long, filament opposite posterior petal 3–3.5 mm long; anthers (2–) 2.5–3.5 mm long. Ovary glabrous; styles 5.2–6 mm long. Coccus 3.1–3.6 mm long, 2.4–3 mm in diameter, glabrous; areole 2.5–2.7 mm long, 2–2.3 mm wide; outer cotyledon 2.3–2.5 mm long, inner cotyledon 1.8–2 mm long. Chromosome number unknown.

**Phenology.** Collected in flower from November through April, in fruit from January through April.

**Distribution (Fig. 35).** Mexico (Colima, Jalisco, México, Michoacán, Morelos); mostly in wet or humid places in forests dominated by pines, oaks, and firs, also at roadside; 1360–2800 m.

**REPRESENTATIVE SPECIMENS.** **Mexico.** COLIMA: Mpio. Comala, fraccionamiento 5 km antes de llegar a San Antonio carr. Quesería–San Antonio, *Acevedo R. & López 1153* (IEB, MICH, TEX, WIS, XAL); Volcán de Colima, *Zepeda R. s.n.* (IBUG).—JALISCO: W slopes of Sierra de San Sebastián, 15–30 km (str line) N of Mascota, rd to San Sebastián, *Anderson & Anderson 5962* (ENCB, MICH, SD); Sierra de Minatlán above Haceradero [aserradero?], *Boutin & Kinnach 2960* (CAS, MEXU); Km 33 sobre la brecha a Talpa de Allende, entrando por la carr. Puerto Vallarta–El Tuito, *Campos V. 4531* (MEXU, TEX); Mpio. Atengo, Vereda de Tacota a Rancho Viejo, *Cházaro B. et al. 6874* (IEB, MICH, TEX, XAL); Mpio. San Sebastián, 23.6 km from San Sebastián on rd to Talpa, *Cowan 4760* (NY, TEX); Estación de Micro-ondas, Volcán de Fuego, *Díaz L. 3125* (CAS, ENCB, GUADA); Mpio. Autlán, 16–17 km al SSE de Autlán, 4–5 km al S de Ahuacapan, Zacahuautla, 19°37'43"N 104°19'00"W, *Guzmán & López 629* (MEXU, WIS, ZEA); Mpio. Venustiano Carranza, Cerro Viejo subida por Apango, *Huerta et al. 216* (MICH, TEX, XAL); 1.5–3 km al E de la Est. Biol. "Las Joyas," camino al Cerro El Almeal, 19°34'–35"N, 104°16'W, *Judzewicz & Cochran 4845* (IBUG, MEXU, WIS, ZEA); 12–15 km (str line) SW of Bolaños, near summits along "Camino Viejo" to Berbería, *McVaugh 25894* (MICH); foothills of Sierra de Manantlán, along rd to summit-pass, 16–22 km S of El Chante, *McVaugh 26100* (MICH); from San Sebastián to Real Alto, *Mexía 1637-a* (A, CAS, GH, MICH, MO, UC, US); Km 36 de la carretera a Las Minas de Cuale, la cual comienza aproximadamente a 7–9 km al W de El Tuito, *Panero 2866* (TEX); Mpio. Guzman, faldas del Nevado de Colima, *Pérez A. 30* (IBUG); Mpio. Toluca, 7–9 km al W de Los Sauces, camino a Terreros, El Terrero, *Vázquez & Guzmán 4154* (WIS, ZEA).—MÉXICO: Mpio. Valle de Bravo, 3 mi NE de Temascaltepec, *Dunn & Dunn 18965* (ENCB, NY); Rancho San Lorenzo, near town of Valle de Bravo, *Gilly 2* (MICH, NY); Nanchititla, Temascaltepec, *Hinton 7364* (BM, F, MEXU, NY, S, US); Cañada de Nanchititla, *Matuda 38268* (LL, MEXU); 6 km E of Nanchititla, 30 km SW of Tejpilco, 18°50'N, 100°45'W, *Neill 5365* (MEXU, MICH, MO); Mpio. Tejpilco, Ocoatepec, *Rzedowski 25296* (DS, ENCB, LL, MICH); ca. 15.5 mi N of Tejpilco, ca. 3.5 mi S of Temascaltepec on Hwy 134 to Toluca, 19°02'N, 100°03'W, *Woodruff 271* (F, MO, TEX).—MICHOCÁN:

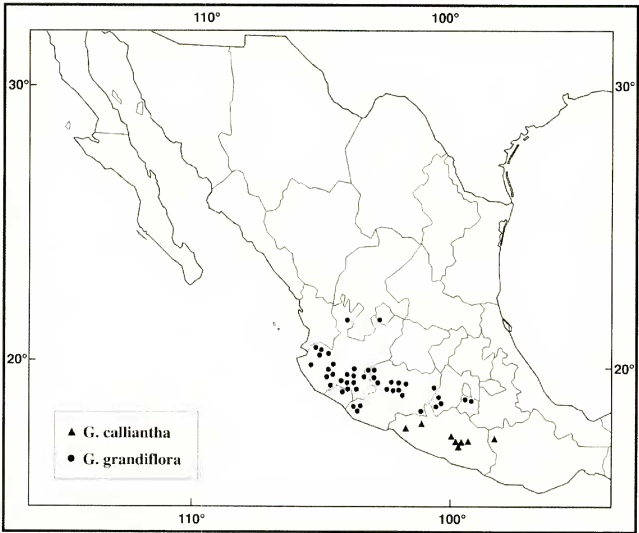


FIG. 35. Distribution of *Galphimia calliantha* and *G. grandiflora*.

mountains W of Aguililla, rd to Aserradero Dos Aguas, *Anderson & Anderson 5881* (DUKE, ENCB, MBM, MICH, SD); Los Cantiles, carr. Morelia, *Cedillo T. 974* (ENCB, LL, MEXU, MO); Mpio. Coahuacán, 20.9 km al W de Coahuacán hacia Coahuayana, *Cowan 4910* (MICH, TEX); Mpio. Uruapan, Presa Cupatitzio, Km 89 de la carr. Uruapan-Playa Azul, desviación a Matargarán, *Fernández N. 4939* (ENCB, IEB, MICH); Mpio. Jiquilpan, *García R. 825* (WIS); Mpio. Zitácuaro, Zitácuaro-Lomas, *Hinton et al. 13435* (BM, DS, F, GH, MEXU, MICH, NY, UC, US); Mpio. Uruapan, Tancitaro, *Hinton et al. 15684* (GH, LL, NY, TEX, US); S-facing slopes of mts between Río del Salto and La Polvilla, 18 mi E of Morelia, *King & Soderstrom 5098* (MEXU, MICH, NY, TEX, UC, US); 3-4 km al N de Tacámbaro, *Kishler 158* (MEXU, MO); Mpio. Zacapu, 5 km al S de Las Canoas, *Martínez L. 623* (ENCB, IBUG, IEB, MEXU); Mpio. Ziracuaretiro, 2 km al NE de San Andrés Corú, *Martínez L. 967* (ENCB, IEB, XAL); Mpio. Zinapécuaro, cerca de Santa Cruz, *Santos M. 1205* (CHAPA, ENCB, IBUG, IEB, MEXU); 3 km de la entrada a Tingambato, carr. a Huetamo, *Torres & Ramírez 13762* (ENCB, IEB, MEXU, MICH).—MORELOS: Tepoztlán, *Paray 1291* (ENCB, MEXU, MICH); above Cuernavaca, *Pringle 8036* (A, BM, BR, C, F, G, GH, GOET, L, MEXU, MO, NY, S, UC, US, W).

*Galphimia grandiflora* is named for its unusually large petals; at maturity, the limbs are up to 15.5 mm long and 9 mm wide. The laminae bear large, prominent peglike glands at or near the base. This showy and attractive species is a common large herb or shrub, or even treelet, of western Mexico, and often has been confused with other partly sympatric species with persistent petals. Its leaves are similar to those *G. floribunda*, which is easily distinguished by its nearly to entirely glabrous inflorescences. *Galphimia multicaulis* differs in its very short petioles (mostly 3-8 mm long) and *G. paniculata* in having the leaf glands borne at the middle of the petiole.

Small (1910) included *G. grandiflora* in his broad circumscription of *Thryallis glauca*.

**26. *Galphimia floribunda*** C. Anderson, sp. nov.—TYPE: MEXICO. Sonora: Sierra La Chuna, Río Mayo, 27 Feb 1935, *Gentry 1372* (holotype: MICH!; isotypes: A! ECON! K! MEXU! MO! S! UC!). Fig. 36

Frutex. Laminae foliorum majorum 6–14.5 cm longae, 2.7–9 cm latae, ellipticae vel ovatae vel rhombicae, glabrae, margine integra, glandulis 0.5–1.5 mm diametro, sessilibus vel pedicellatis; petioli 2.4–6.5 cm longi. Inflorescentia paniculata, axibus glabris. Petala persistentia; petala lateralibus ungue (1.3–) 1.5–2.2 mm longo, limbo 7.5–10 mm longo, 4–6 mm lato, elliptico vel lanceolato; petalum posticum ungue 2.2–3.3 mm longo, limbo 8.5–12 mm longo, 6–8 mm lato, late elliptico vel ovato. Antherae 2.4–3.5 (–3.8) mm longae. Ovarium glabrum; styli 4.5–5.7 mm longi. Coccus ca. 3.8 mm longus, glaber.

Shrub to 4 m; plants entirely glabrous or with sparsely scattered hairs in the inflorescence; hairs 0.1–0.5 mm long, subsessile, straight or wavy to crisped, reddish. Laminae of the larger leaves 6–14.5 cm long, 2.7–9 cm wide, elliptical to ovate or rhombic, the larger leaves very broadly so, apex apiculate or acute, base attenuate, glabrous, secondary veins prominent abaxially; petioles 2.4–6.5 cm long, glabrous; glands a pair borne at base of blade or apex of petiole, each gland 0.5–1.5 mm in diameter, disklike and prominent, or peglike and up to 1 mm long; stipules 1.5–3.3 (–4) mm long, 0.8–1.5 mm wide, glabrous. Inflorescence a large panicle composed of racemes, the axes glabrous or with a few scattered hairs; peduncles (4–) 5–11 mm long, pedicels 4–8 (–12.5) mm long, peduncles 0.6–1.8 times as long as pedicels, both glabrous or with a few scattered hairs; bracts (1.7–) 2.5–4.5 (–6.2) mm long, 0.5–1 mm wide, linear to narrowly triangular, bracteoles 1.5–3.3 mm long, 0.5–0.7 mm wide, linear or sometimes narrowly triangular, bracts and bracteoles glabrous or sometimes with scattered hairs along the margin; bracteoles borne in the distal 1/4–1/2 of the peduncle, subopposite or up to 1.5 mm apart, the more distal inserted 0.7–4.5 mm below the apex of the peduncle. Sepals 3.5–5 mm long, 1.5–2.2 mm wide, elliptical to oblong, glabrous, margin entire; glands absent. Petals persistent, unequal, yellow, glabrous, margin finely denticulate; lateral petals: claw (1.3–) 1.5–2.2 mm long, 0.5–0.8 mm wide, limb 7.5–10 mm long, 4–6 mm wide, elliptical to lanceolate, apex subacute, base attenuate; posterior petal: claw 2.2–3.3 mm long, 0.8–1 mm wide, limb 8.5–12 mm long, 6–8 mm wide, broadly elliptical to ovate, apex obtuse, base attenuate. Stamens of unequal length; filament opposite anterior sepal (3.5–) 4.1–5.5 mm long, filaments opposite anterior-lateral petals 3.5–4.3 (–4.7) mm long, filaments opposite anterior-lateral sepals 3.5–4.5 (–5.2) mm long, filaments opposite posterior-lateral petals 2.7–4.2 mm long, filaments opposite posterior-lateral sepals 3–4.2 (–5.3) mm long, filament opposite posterior petal (1.7–) 2.2–2.7 (–3.5) mm long; anthers 2.4–3.5 (–3.8) mm long. Ovary glabrous; styles 4.5–5.7 mm long. Coccus ca. 3.8 mm long, 2.2 mm in diameter, glabrous; areole ca. 3 mm long, ca. 2.1 mm wide; outer cotyledon ca. 2.5 mm long, inner cotyledon ca. 1.7 mm long. Chromosome number:  $n=6$  (Seavey 1975, as “*G. glauca*”).

Phenology. Collected in flower from late December through June (one collection from September, *Urbina s.n.* MEXU-16562), in fruit from January through June.

Distribution (Fig. 30). Mexico (Sonora, Chihuahua, Sinaloa, Nayarit, Durango, Jalisco); on dry slopes in deciduous forest, oak forest, and pine-oak forest; 500–1300 m.

REPRESENTATIVE SPECIMENS. **Mexico.** CHIHUAHUA: Mpio. Batopilas, barranca de Batopilas, vic. of Arroyo San Fernando, W of La Bufa, *Bye 3580* (TEX); Cumbres de Loreto, 26°50'N 107°35'W, *Hewitt 268* (GH); Río Batopilas bridge, 1.5 mi E of La Bufa, *Kinnach 904* (UC, MEXU); Río Urique Canyon,

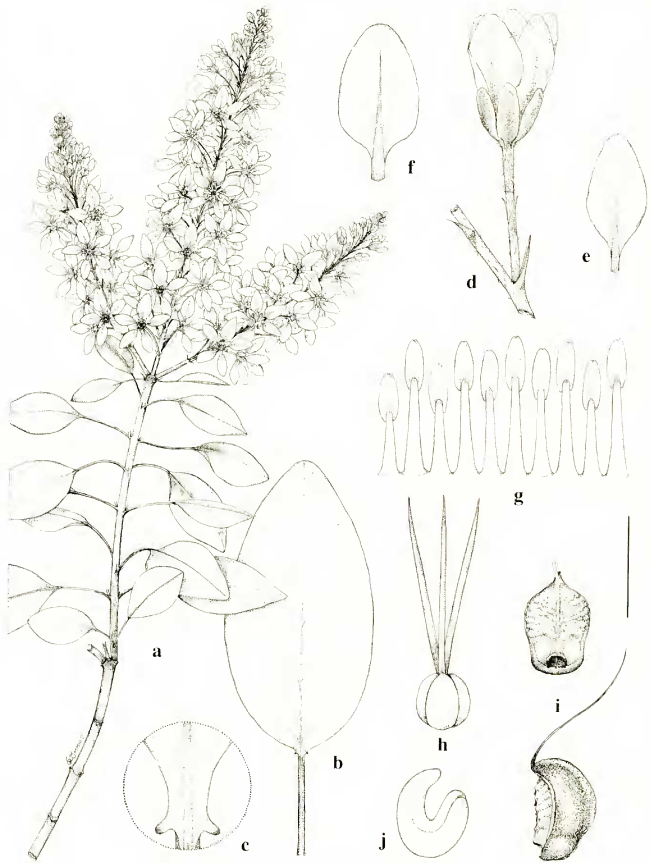


FIG. 36. *Galphimia floribunda*. a. Flowering branch. b. Detached large leaf. c. Base of lamina. d. Opening flower, borne on pedicel and peduncle, with portion of inflorescence axis. e. Lateral petal. f. Posterior petal. g. Androecium laid out, abaxial view, the stamen at left opposite posterior petal. h. Gynoecium. i. Cocci, adaxial view (above) and lateral view (below). j. Embryo. Scale bar: a, b, 4 cm; c, e, f, 8 mm; d, 5.7 mm; g, i, 4 mm; h, j, 2.7 mm. (Based on: a, i, j. *Palmer 284* in 1890, US; b, c, *Rose 13095*, US; d-h, *Reina G. 97-338*, MICH.)

*Pennington 111* (TEX).—DURANGO: Mexico hwy 40, 6.8 mi E of El Palmito, ca. 53 mi E of Concordia, *Breedlove 4254* (DS, DUKE, MICH); near Chacala, *Goldman 326* (GH, NY, US); Mpio. Sianori, *González Ortega 5379* (DS, K, MEXU, US); San Ramón, *Palmer 101* in 1906 (CM, F, GH, K, MO, NY, UC, US).—JALISCO: rd from Tequila to micro-ondas on Volcán Tequila (Montana Azul), *Daniel 4791* (CAS, DUKE, MICH, NY); Mpio. Ixtlahuacán del Río, 30 km al N de Ixtlahuacán del Río, ejido Pitallitos, *Flores M. 549* (IBUG, MEXU); Mpio. Mascota, Cerro de la Barranca, *González T. 36* (ENCB, MICH).—NAYARIT: en la base del Cerro Sangangüey, a 20 km al SE de Tepic, 21°28'N, 104°43'W, *Téllez V. 10398* (MEXU, MO).—SINALOA: Mpio. Rosario, 4.9 mi E of Santa Lucía, ca. 23 mi E of Concordia on Mexico 40, *Breedlove 1663* (DS, DUKE, MICH); Mpio. San Ignacio, Balboa, San Javier, *González Ortega 5094* (MEXU, US); Mpio. Cosalá, La Copetona, arriba de Guadalupe de Los Reyes, *Tenorio L. 8358* (MEXU, MICH); Mpio. Concordia, carr. Mazatlán–Durango entre Km 240 al 256, entre Ojo de Agua y la Guayamera, *Vega 3617* (GUADA, MEXU).—SONORA: 5.1 mi E of Santa Rosa on old road to Yecora, *Goldberg 76-155* (ENCB); Sierra de los Alamos, *Palmer 284* in 1890 (GH, MICH, NY, US); Mpio. Yecora, Arroyo del Pilladito, near Tepoca, 28°26'20"N, 109°15'30"W, *Reina 97-338* (MICH); vicinity of Alamos, Sierra de Alamos, *Rose 12794, 13095* (NY, US).

*Galphimia floribunda* is a handsome shrub named for its unusually large, distally often nodding inflorescences, which are glabrous or have very few scattered hairs even in the youngest parts. In most species (except *G. glandulosa* and *G. sessilifolia*) the inflorescence axes are pubescent, the immature portions often densely so; the absence of such vestiture readily separates *G. floribunda* from *G. grandiflora* and *G. paniculata*, two other species with persistent petals with which it is sympatric in the southern part of its range. In *G. floribunda* the leaf glands are borne at the base of the lamina, often at the apex of a tooth (Fig. 36c) in larger leaves. *Galphimia grandiflora* may have similar leaf glands, but those of *G. paniculata* are placed at the middle of the petiole.

#### EXCLUDED NAMES

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*Galphimia pubescens* (Adr. Juss.) Herter, Fl. illustr. Uruguay 14(11): 491. 1956.—Not validly published (ICBN Art. 33.3).

*Galphimia cauca* Spreng., Syst. veg. 2: 385. 1825. = *Caucanthus edulis* Forssk.

*Galphimia chrysophylla* (H. B. K.) Spreng., Syst. veg. 2: 385. 1825. = *Byrsonima chrysophylla* H. B. K.

*Galphimia longifolia* H. B. K., Nov. gen. sp. 5: 173. 1822 ["1821"]. = *Lophanthera longifolia* (H. B. K.) Griseb.

*Galphimia mollis* H. B. K., Nov. gen. sp. 5: 173. 1822 ["1821"]. = *Tetrapteryx cotoneaster* Adr. Juss.

*Thryallis hirsuta* Sessé & Mociño, Fl. mex. 119. 1894; ed. 2, 109. 1894.—The Sessé & Mociño herbarium (at MA) does not include a collection labeled with this name. Most likely, the description was based on a specimen of *Echinopteryx glandulosa* (Adr. Juss.) Small (W. R. Anderson, pers. comm.).

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## APPENDIX

## SPECIES OF GALPHIMIA OCCURRING IN MEXICO, LISTED BY STATE

- Aguascalientes: *G. glauca*
- Baja California Sur: *G. angustifolia*
- Chiapas: *G. speciosa*
- Chihuahua: *G. floribunda*, *G. vestita*
- Coahuila: *G. angustifolia*
- Colima: *G. grandiflora*, *G. langlassei*, *G. montana*, *G. tuberculata*
- Durango: *G. angustifolia*, *G. floribunda*, *G. montana*
- Guanajuato: *G. glauca*, *G. multicaulis*
- Guerrero: *G. calliantha*, *G. glandulosa*, *G. hirsuta*, *G. langlassei*, *G. mirandae*, *G. montana*, *G. paniculata*, *G. radialis*, *G. tuberculata*
- Hidalgo: *G. glauca*, *G. gracilis*
- Jalisco: *G. floribunda*, *G. glauca*, *G. grandiflora*, *G. langlassei*, *G. mexiae*, *G. montana*, *G. multicaulis*, *G. paniculata*, *G. tuberculata*
- México: *G. glandulosa*, *G. grandiflora*, *G. multicaulis*, *G. paniculata*
- Michoacán: *G. glandulosa*, *G. grandiflora*, *G. langlassei*, *G. montana*, *G. multicaulis*, *G. paniculata*
- Morelos: *G. grandiflora*, *G. paniculata*
- Nayarit: *G. floribunda*, *G. mexiae*, *G. montana*, *G. paniculata*, *G. tuberculata*, *G. vestita*

Nuevo León: *G. angustifolia*, *G. glauca*

Oaxaca: *G. arenicola*, *G. calliantha*, *G. elegans*, *G. multicaulis*, *G. oaxacana*, *G. paniculata*, *G. sessilifolia*,  
*G. speciosa*

Puebla: *G. gracilis*, *G. mirandae*, *G. paniculata*, *G. speciosa*

Querétaro: *G. glauca*, *G. gracilis*

San Luis Potosí: *G. angustifolia*, *G. glauca*, *G. gracilis*

Sinaloa: *G. angustifolia*, *G. floribunda*, *G. glandulosa*, *G. montana*, *G. tuberculata*, *G. vestita*

Sonora: *G. angustifolia*, *G. floribunda*, *G. vestita*

Tamaulipas: *G. angustifolia*, *G. glauca*, *G. gracilis*

Veracruz: *G. gracilis*, *G. speciosa*, *G. glandulosa* (?)

Zacatecas: *G. glauca*, *G. montana*, *G. paniculata*